Feb. 2, 1954 J. S. KAMBORIAN 2,667,908

UPHOLSTERING MACHINE

Filed April 19, 1949 4 Sheets-Sheet 1

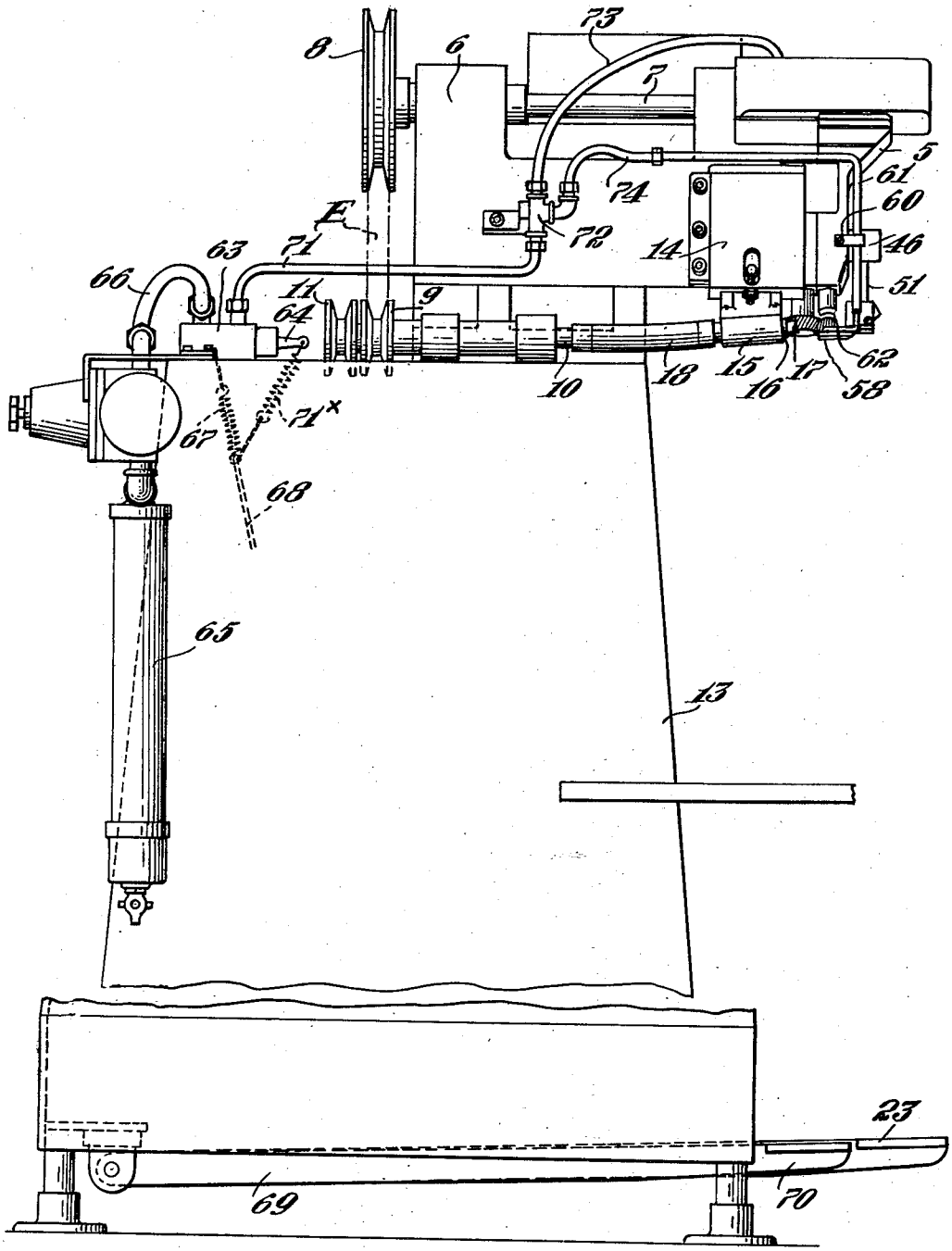


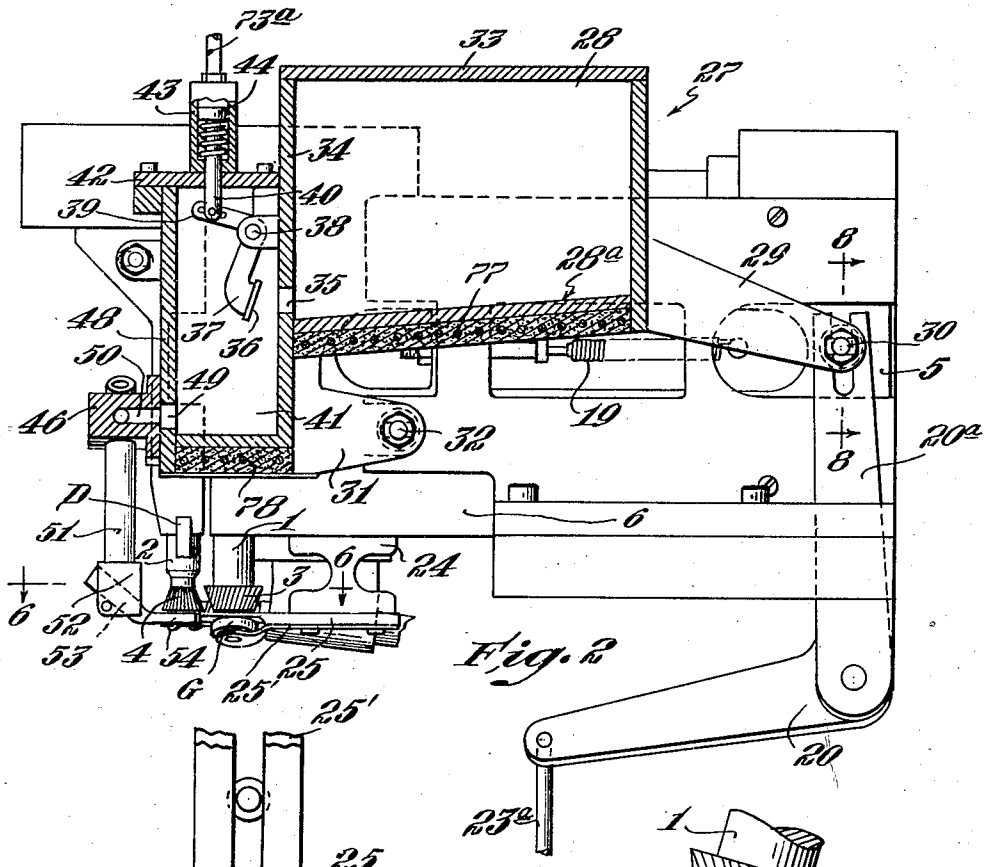
Fig. 1

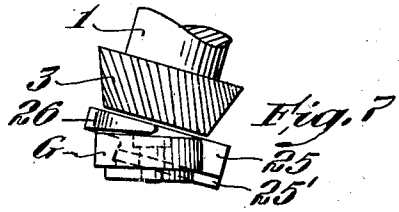
Inventor
Jacob S. Kamborian
by Roberts Cushman & Grover
Att'ys.

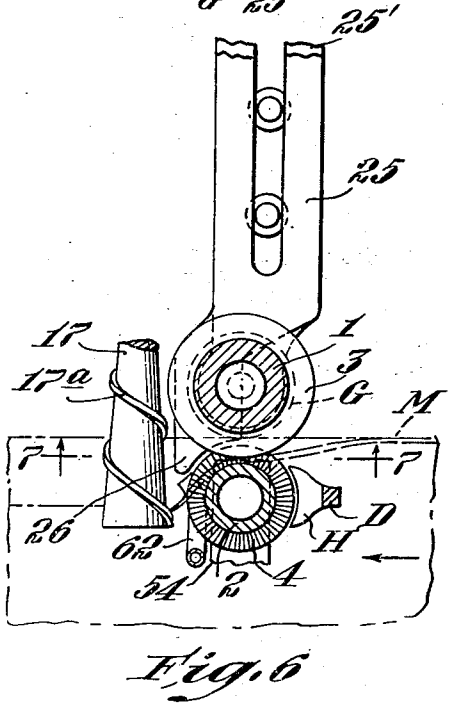
Feb. 2, 1954 J. S. KAMBORIAN 2,667,908

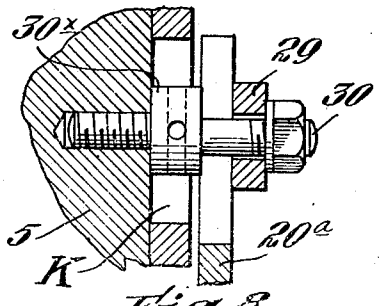
UPHOLSTERING MACHINE

Filed April 19, 1949 4 Sheets-Sheet 2









Inventor:
Jacob S. Kamborian
by Fishburn Cushman & Cooper
Attys.

Feb. 2, 1954 J. S. KAMBORIAN 2,667,908

UPHOLSTERING MACHINE

Filed April 19, 1949 4 Sheets-Sheet 3

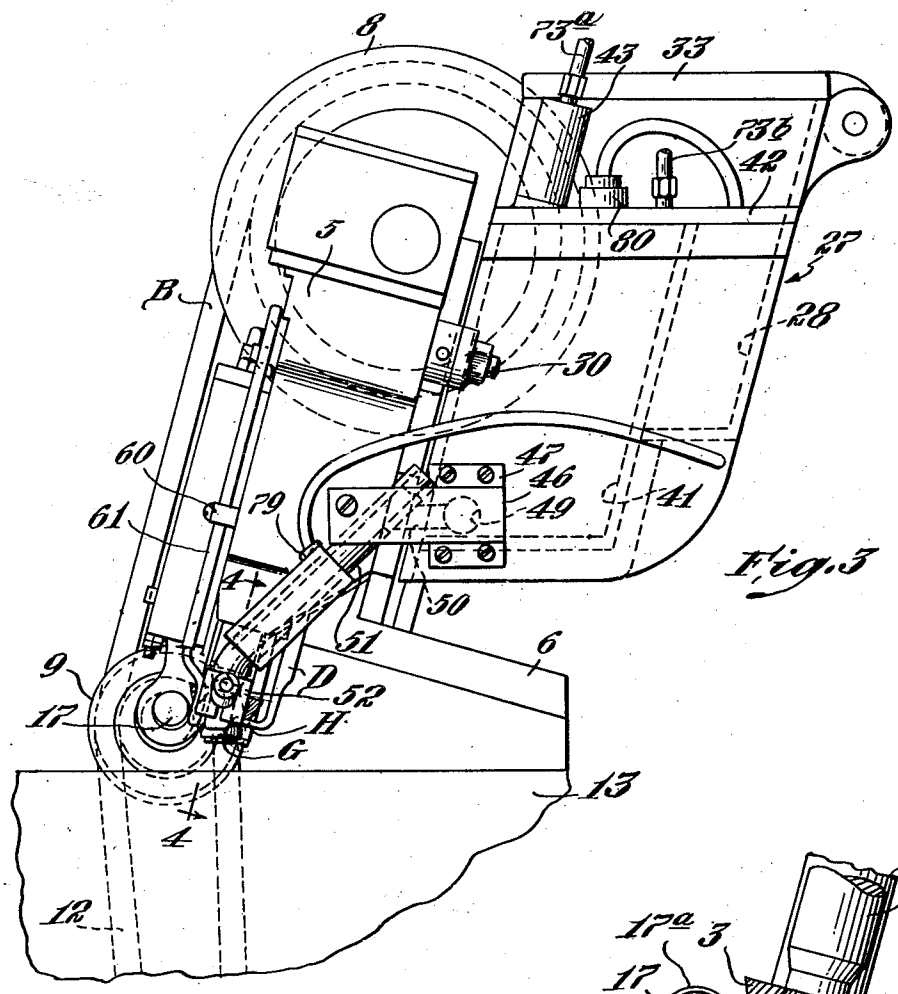


Fig. 3

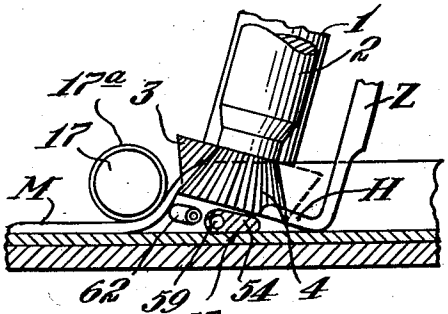
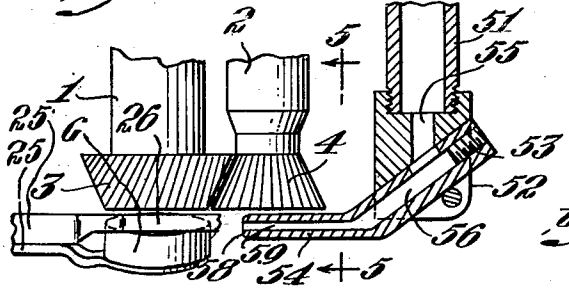


Fig. 5

Fig. 4



Inventor
Jacob S. Kamborian
by Roberts Cushman & Grover
Attys.

Feb. 2, 1954 J. S. KAMBORIAN 2,667,908

UPHOLSTERING MACHINE

Filed April 19, 1949 4 Sheets-Sheet 4

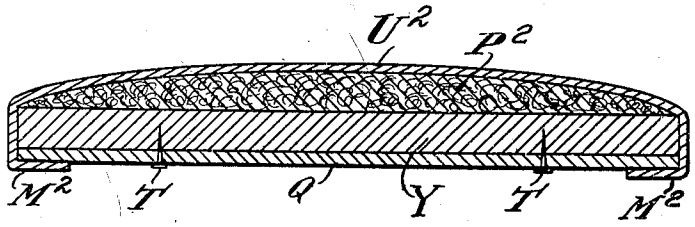


Fig. 9

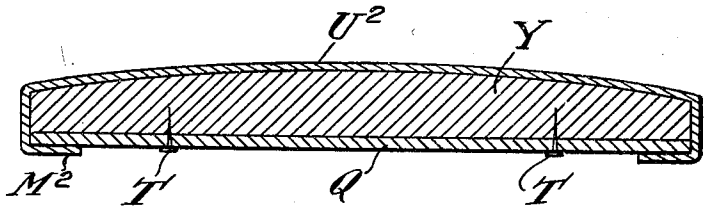


Fig. 10

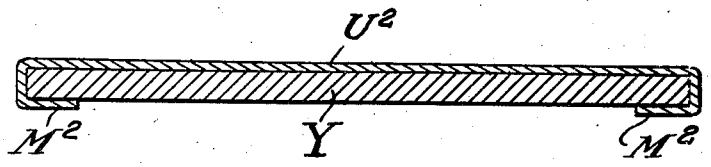


Fig. 11

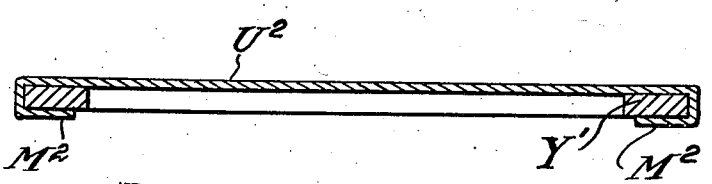


Fig. 12

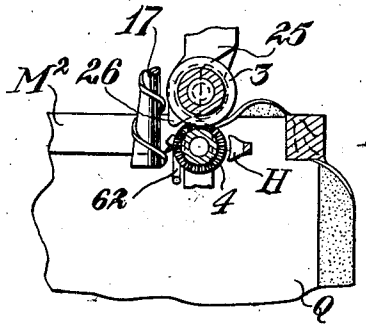


Fig. 13

Inventor
Jacob S. Kamborian
by Roberts Cushman & Grover
Att'ys.

Patented Feb. 2, 1954

2,667,908

UNITED STATES PATENT OFFICE

2,667,908

UPHOLSTERING MACHINE

Jacob S. Kamborian, West Newton, Mass.

Application April 19, 1949, Serial No. 88,401

13 Claims. (Cl. 154—1.8)

1

This invention pertains to apparatus for use in stretching pliable sheet material, for instance, cloth, leather, leather substitutes, etc., about a substantially rigid core or form to one surface of which, hereafter referred to as the "bottom," the margin of the sheet material is secured by adhesive, and which, while of more general application, finds utility in the upholstery and applied industries. Illustrative examples of the use of the apparatus are for applying covering material to a chair seat or pad; for applying the ornamental covering material to a panel, such as is commonly used as interior finish for the body and doors of a passenger automombile; for applying leather, or the like, to an open frame designed to form part of a traveling bag, trunk or other piece of luggage or for stretching or "lasting" the upper of a shoe about a rigid form comprising a last having an insole attached to its bottom.

Since the sheet material, hereinafter referred to as the "covering," thus applied is somewhat elastic, and under tension when its margin is united to the core or form, and since adhesive is the means for securing the margin to the form, it is requisite that the adhesive anchor the material with sufficient tenacity to prevent retraction of the sheet material immediately upon cessation of the stress applied by the machine. Moreover, if the adhesive is to be applied to the parts during the stretching of the material about the form, it is requisite that the adhesive be of a very quick-setting type. Thermoplastic adhesive, which is only fluid when heated but which sets quickly when cooled, appears to be the most useful for the purpose.

The present invention has for one of its objects the provision of means for delivering an adhesive, in fluid condition, into the angle between the stressed sheet material and the surface to which it is to adhere just before the stressed material is laid down onto said surface. A further object is to provide a machine operative in a continuous manner to apply stretching stress to the sheet material, as the form or core is moved relatively to the means for applying stress, so that the stretching operation may be continued uninterruptedly around the margin of the core or form without at any time completely letting go of the marginal portion of the sheet material. A further object is to provide means operative to deliver a hot and fluid thermoplastic adhesive into the angle between that surface of the form or core to which the margin of the sheet material is to be secured and the marginal

2

portion of the sheet material to which the stress is being applied, and just before the marginal material is pressed down onto the surface of the form to which it is to be attached. A further object is to provide novel means for supplying a thermoplastic adhesive, in liquid form, to the point of use. A further object is to provide a machine wherein gripping rolls concomitantly apply the stretching stress and advance the work, and wherein the stretching force exerted by the rolls is resisted by a hold-down device which engages that surface of the form or core to which the margin of the sheet material is to be secured, and wherein the hold-down device is utilized as a delivery nozzle through which the fluid adhesive is discharged. A further object is to provide means operative to insure a free discharge of the heated fluid at the point of use and for hastening the setting of the adhesive. Other and further objects and advantages of the invention will be pointed out in the following more detailed description and by reference to the accompanying drawings wherein:

Fig. 1 is a fragmentary more or less diagrammatic elevation of the left-hand side of the machine;

Fig. 2 is an elevation, to larger scale, of the right-hand side of the machine head, with the reservoir and heating chamber in vertical section and with certain parts broken away and omitted.

Fig. 3 is a fragmentary front elevation of the machine head with certain parts omitted;

Fig. 4 is a fragmentary section, to larger scale, in a plane indicated by the line 4—4 of Fig. 3;

Fig. 5 is a fragmentary section in the plane of the line 5—5 of Fig. 4;

Fig. 6 is a fragmentary horizontal section on the line 6—6 of Fig. 2, but to larger scale, and with parts broken away and omitted;

Fig. 7 is a fragmentary elevation, substantially at the plane of line 7—7 of Fig. 6, but omitting the wiper and other parts;

Fig. 8 is a fragmentary section, to larger scale, on the line 8—8 of Fig. 2;

Figs. 9, 10, 11 and 12 are diagrammatic vertical sections illustrative of kinds of work which may be done with the assistance of the apparatus of the present invention; and

Fig. 13 is a diagrammatic plan view partly in horizontal section illustrating the cooperative relation of the several work-contacting elements.

Referring to the drawings (Figs. 2 and 4), the numerals 1 and 2 designate parallel, oppositely-rotating, power-driven shafts carrying the work-

gripping rolls 3 and 4, respectively, at their lower ends. As here illustrated, the axes of the shafts 1 and 2 are inclined downwardly and to the left, as viewed in Figs. 3 and 5. As shown, the rolls 3 and 4 are of frusto-conical form, the roll 3, which engages the outer surface of the margin of the covering material, tapering downwardly, while the roll 4, which engages the inner surface of the margin of the covering material, tapers upwardly. Preferably the peripheral surfaces of the rolls 3 and 4 are ribbed, fluted or knurled in order to insure a good grip upon the material. While frusto-conical rolls are desirable for most uses, it is within the scope of the invention to use rolls of other types, for example, cylindrical rolls or toothed rolls similar to gears and having radial or helical teeth.

For convenience in introducing the work between the rolls 3 and 4, the shaft 2 may be arranged to be moved bodily away from the shaft 1. Thus, the shaft 2 may turn in bearings carried by a horizontally movable slide 5 mounted in guides carried by the stationary machine head 6 (Fig. 1), the head 6 also having bearings for the horizontal, power-driven shaft 7. A worm (not shown), fixed to the forward portion of the shaft 7 constantly meshes (regardless of the position of the slide 5) with a worm wheel fixed to the upper end of the shaft 2. The same worm, by appropriate gearing, drives the shaft 1 oppositely to the shaft 2. A pulley 8, fixed to the rear end of the shaft 7, is driven by a belt E passing over a pulley 9 on a shaft 10, turning in bearings at the lower part of the machine head. A second pulley 11, on the shaft 10, is driven by a belt 12 (Fig. 3) which passes about a pulley (not shown) which is driven by a motor (not shown) conveniently housed within the hollow base 13 on which the machine head 6 is mounted.

At its left-hand side (Fig. 1) the machine head is provided with guides for a vertically adjustable slide 14, preferably urged downwardly by a spring, and which carries a horizontally elongate bearing 15 for a shaft 16, to whose forward end is secured the rear end of a rotary wiper 17. This wiper comprises a conically tapered body fixed at its smaller end to and supported solely by the shaft 16. A helical rib 17a, carried by the tapering body, constitutes a work-impelling element operative to exert a thrust in the direction of the axis of the shaft 16 against the marginal material with which said rib contacts. The shaft 16 is connected to the forward end of the shaft 10 by a flexible shaft 18, or equivalent drive means, which permits vertical bodily adjustment of the shaft 16.

The slide 5 (Fig. 2) is urged rearwardly by a spring 19 and may be moved forwardly to separate the rolls 3 and 4 by means of a bell-crank lever, comprising the arm 20, which is connected by appropriate means 23a (Fig. 2) to a treadle 23 (Fig. 1). The bell crank also comprises an upright arm 20a which is forked at its upper end and which engages a pin 30 projecting from the slide 5 (Figs. 2 and 8) and through a horizontal slot K (Fig. 8) in the side wall of the head 6.

A bracket 24 (Fig. 2) fixed to the machine head supports two elongate slotted bars 25 and 25' (Fig. 6), one directly above the other, said bars being independently adjustable from front to rear. A vertical pivot pin is fixed in the forward end of the bar 25' and an edge guide roll G (Figs. 4 and 7) turns freely on this pin. This roll G is located directly below the lower end of the gripper roll 3, and the bar 25' is so adjusted that the periphery of the roll G is substantially tangent to the vertical plane of the bite of the rolls 3 and 4 at the lower edges of the latter. Roll G is not necessary for all kinds of work.

A folding blade is carried by the forward end of the bar 25. This folding blade has a work-engaging toe 26 (Figs. 4 and 6) located just below the plane defined by the lower ends of the rolls 3 and 4 and spaced from the right-hand side of the wiper, as viewed in Fig. 6. The operating end of the toe 26 is wedge shaped (Fig. 7) and lies in the angle defined by the lower end of the roll 3 and the upper face of the roll G, the lower face of the toe 26 being substantially horizontal and just above the plane of the upper surface of the form to which the covering is to be applied. The toe 26 of the folding blade is directed toward the lower edge of the roll 4 (Fig. 6) and is concave concentrically with the latter roll, the concave edge extending from the bite of the rolls 3 and 4 through an arc of approximately 60° toward the wiper. When the work is held in contact with the roll G, the marginal portion of the covering extends up into position to be gripped between the rolls 3 and 4. Since the margin-gripping surfaces of the rolls incline away from the guide G, the margin will be bent inwardly during the application of stretching stress. As the stretched margin leaves the rolls it is further bent over toward the surface of the form or core by passing beneath the forwardly projecting toe of the folding blade so that when the rotating wiper engages the margin, the latter has already been laid substantially flat.

A work hold-down H (Figs. 5 and 6) of crescent or shallow U-shape, in plan view, is arranged so as partially to embrace the front roll 4, being situated at the inner side of the margin. The under or work-engaging surface of the hold-down H is preferably substantially at the level of the lowermost point in the bottom edge of the roll 4 and contacts the upper face of the form. A bracket Z (Fig. 5), adjustably secured to the slide 5, supports the hold-down H.

A reservoir 27 (Fig. 2) is secured to the right-hand side of the slide 5. This reservoir has walls defining a chamber 28 of substantial capacity, having a forwardly and downwardly sloping floor 28a, located above the level of the rolls 3 and 4, and which is designed to hold a reserve supply of adhesive. Preferably the adhesive employed is a synthetic thermoplastic resin. As received, resin of this type is usually in solid form, varying from fine powder to granules or large lumps. It is placed in this reservoir 27 and reduced to liquid form therein by the application of heat, as hereafter more fully described. As illustrated, the reservoir 27 is a large, box-like container, supported by the slide 5, with provision for adjustment relatively to the slide. Thus, as illustrated, the reservoir has a rearwardly-extending rigid arm 29 having an opening which receives the pin 30, above described, by means of which motion is transmitted from the arm 20a of the bell crank to the slide 5. As shown in Fig. 8 the outer end portion of the pin 30, which passes through the opening in the arm 29, is eccentric with reference to the inner end portion of the pin which has screw-threaded engagement with the slide 5. The pin has a fixed collar 30x provided with radial holes to accommodate a spanner wrench, by means of which the pin may be turned. Turning of the pin adjusts the position of the arm 29 by reason of the eccentric

form of the pin. The reservoir has another bracket arm 31 provided with an opening for the reception of a pin 32, similar to pin 30, and turning in a threaded hole in the slide 5.

Preferably the reservoir 27 has a hinged cover 33, which is normally closed but which may be raised to permit the reservoir to be filled. The forward wall 34 of the reservoir 27 is provided with a normally open delivery port 35 (Fig. 2) which at times may be closed by a valve 36. This valve 36 is fixed to the lower arm 37 of a bell-crank lever pivoted at 38 and having a horizontal arm 39 which is pivotally connected to the lower end of a vertically slidable piston rod 40.

The port 35 opens into a pressure chamber 41, defined by parts carried by or integral with the forward wall of the reservoir 27, this pressure chamber having a removable, normally airtight top 42, on which is mounted a cylinder 43, in which slides a piston 44 fixed to the upper end of the rod 40. A spring 45 tends to lift the piston so as to keep the valve 36 open.

A block 46 (Figs. 2 and 3) is fixed to the front wall 48 of the pressure chamber, said wall having an outlet port 49 which communicates with a slot 50 in the inner face of the block 46. A downwardly-inclined, rigid, tubular arm 51 is mounted in the block 46. The block is split and provided with a bolt for drawing the portions at opposite sides of the split together so as to clamp the arm 51 between them. By this means it is possible to turn the arm 51 for a purpose hereafter described. The axial bore in the tubular arm 51 communicates at all times with the slot in the block. A cap member 52 (Fig. 4) is secured to the lower end of the rigid tubular arm 51 and the tubular shank 53 of a delivery foot 54 is secured in a downwardly inclined bore in the cap 52. A passage 55, in the cap 52, provides communication between the bore in the arm 51 and a passage 56 in the shank 53. The foot 54 has a substantially flat undersurface 57 (Fig. 5) for contact with that surface of the form or core to which the margin of the cover is to be secured. Preferably the foot is more or less wedge shape in transverse section (Fig. 5) so that it may lie in the angle between said surface of the core and the inclined bottom face of the roll 4, the foot being directly below the lower surface of roll 4. The foot also constitutes a delivery nozzle for adhesive, being provided with a delivery passage 59 forming a continuation of the passage 56. The lower surface 57 of the foot 54 contacts the surface of the form during the operation, the foot constituting a hold-down for the work as well as a delivery nozzle for the adhesive. The rear edge 58 (Fig. 4) of the foot is usually so located that during the operation liquid adhesive is delivered from the end of the passage 59 into the angle between the margin of the covering material and the surface of the form to which the margin is to be secured, and just where the margin is being held taut and upright by the gripper rolls. By adjustment of the eccentric pins 30 and 32 the reservoir may be so adjusted that the delivery end of the foot or adhesive-supply nozzle may be moved substantially horizontally toward or from the edge of the form so that the point of delivery of the adhesive may be varied at will. Thus, for example, it may be so located that the adhesive is ejected directly into contact with the inner surface of the margin of the covering material; so that the adhesive is deposited solely upon the exposed bottom surface of the form; or so that the adhesive is delivered into the apex of the angle defined by the upstanding margin and form, thus simultaneously coating the surface of both of said parts. Furthermore, by turning the tubular arm 51 in the block 46, the foot or nozzle may be swung so as to adjust the delivery point longitudinally of the edge of the form, in other words, to vary the distance between the point of adhesive delivery and the point at which the wiper or presser device acts upon the margin of the covering material. Furthermore, by adjusting the eccentric pin 32, without adjusting the pin 30, the forward end of the reservoir may be moved up or down, thus adjusting the delivery nozzle up or down slightly with reference to the surface of the form. Instead of making the delivery orifice at the rear edge of the foot, the orifice may be formed either in the upper or undersurface of the foot, if preferred, thereby to insure the delivery of the adhesive solely against the margin of the covering or against the surface of the form, as may be desired for the particular use.

A bracket 60 (Figs. 1 and 3) attached to the left-hand side of the slide 5 supports a substantially vertical pipe 61 whose lower end is bent to provide an air nozzle 62 through which a jet of cold air is discharged into the angle between the margin and the surface of the form or core just after the adhesive has been delivered. This cold air acts to cool the adhesive very rapidly so as to hasten its setting.

A valve device 63 (Fig. 1) is mounted upon the rear portion of the machine head. This valve device may be of any customary or desired type, but, as here shown, is of the kind wherein a movable valve normally closes a port or passage and is moved to the open position by swinging a lever 64 downwardly. The casing of the valve 63 is supplied with compressed air from any suitable source, for example, by an air pump (not shown) housed within the base 1 and driven by the same motor which drives the shaft 6. Alternatively, the air may be supplied from a replaceable tank of compressed air obtained from some other source. Preferably, when a pump forms a part of the machine structure, the air is delivered from the pump into a storage tank 65, mounted on or in the base 1, thereby to insure a supply of air at substantially constant pressure. From this tank the air is delivered by the pipe 66 to the casing of the valve 63.

One end of a supporting spring 67 is attached to the machine head and its other end is connected to the upper end of a rod 68 which extends down and is secured at its lower end to a treadle lever 69 having a foot treadle 70 at its forward end. A second spring 71^x connects the upper end of the rod 68 to the lever 64. By depressing the treadle 70, the valve is opened, thus permitting air from the valve casing to escape into a pipe 71, which leads to a manifold 72 mounted on the side wall of the machine head. From this manifold a conduit 73 extends. This conduit has branches 73^a and 73^b (Fig. 3) which lead respectively to the cylinder 43 and into the upper part of the heating chamber 41. Another conduit 74 leads from the manifold to the cold air delivery pipe 61.

The reservoir 27 is heated sufficiently to melt the plastic which has been placed therein. For this purpose an electric heating unit 77 (Fig. 2) may be disposed beneath the floor 28^a of the reservoir. Likewise, the heating chamber 41 is supplied with heat for keeping its contents liquid by an electric heating unit or units 78 arranged

externally of and below the heating chamber. However, other forms of heating means may be employed, for example, steam coils. The heating means selected may be located externally, as shown, or internally of the melting chambers, as desired. To prevent premature cooling and solidification of the adhesive on its way from the chamber 41 to the delivery nozzle, an insulating jacket 79 (Fig. 3) is placed about the tubular arm 51. Desirably, this jacket is heated by an electric heating unit housed within it. To control the heat supplied to the machine, a thermostat 80 (Fig. 3) is mounted on the top of the chamber 41, this thermostat, comprising a heat-responsive element which dips into the chamber 41, is so connected in conventional manner to actuating means for a supply switch for the heating circuit as to open or close said switch at proper intervals of time to keep the adhesive at a predetermined temperature.

Figs. 9 to 12, inclusive, illustrate various applications of the invention to the upholstery or allied arts. Thus, Fig. 9 shows a form or core constituting a chair seat or pad and comprising a flat rigid member Y, for instance, a piece of plywood, or the like, having padding P^2 on one face shaped to provide a convex upper surface and a layer or ply Q on its opposite face, consisting, for example, of cardboard, felt, sheet metal or other appropriate material, here shown as attached to the member Y by means of temporary or permanent tacks T. A cover U^2 of flexible sheet material, such as cloth, leather, sheet plastic or the like, is drawn snugly over the padded face of the form or core and has its margins turned under and secured by adhesive to the exposed undersurface of the ply Q of the form or core. In Fig. 10 a simpler construction is shown wherein the core or form comprises the member Y, itself shaped at its upper surface to provide the desired convexity, and the under layer Q which is attached to the member Y by the tacks T. The cover U^2 is drawn snugly about the convex surface of the part Y and has its margins M^2 secured by adhesive to the underside of the layer Q of the form or core.

A still simpler form or core is illustrated in Fig. 11 such as might be used as a seat or pad for a cheaper type of chair, or which may represent a panel such as is used in passenger automobiles as a finish for the interior of the body and doors. In this instance the form or core consists solely of the part Y, which may be of thin plywood, artificial wood, cardboard, or the like, the cover U^2 being drawn about the upper surface of the part Y and having its margins M^2 secured directly to the undersurface of the part U^2.

In Fig. 12 the form or core consists of an open frame Y^1, for example of wood, plastic, sheet metal or the like such as is sometimes used in the manufacture of suitcases, trunks, etc., as a support for the leather or cloth covering U^2 which is drawn over one face of the frame and which has its margins secured to the opposite face of the frame. The above are illustrative examples, but without limitations of the utilities of the apparatus of the present invention.

In the operation of the machine, and assuming that the motor is running and that air pressure has been built up in the tank 65 and that the reservoir 27 and the heating chamber 41 contain hot liquid adhesive, the valve 36 being open, the operator will depress the treadle 70, thus actuating the valve lever 64 and allowing compressed air to pass through the pipes 71 and 73^a to the cylinder 43, thereby moving the piston 44 to close the valve 36. At the same time, compressed air through pipe 73^b enters the chamber 41 and, pressing upon the surface of the liquid adhesive therein, forces the liquid outwardly through the port 49 and through the pipe 51 down to the foot 54. When the operator perceives that adhesive is being delivered from the passage 59 in the foot, he knows that the machine is ready for the performance of the lasting operation.

The operator now places his foot on the treadle 23, moving the slide 5 forwardly and thus separating the rolls 3 and 4 so that the margin of the covering material, which has previously been loosely assembled with the form or core so as to cover the upper face of the latter and which has preferably temporarily been attached to the core or form, for example by means of a few tacks, may readily be introduced between them. However, skilled operators become accustomed to entering the work between the rolls without actuating the treadle 23.

As the margin of the covering material is gripped between the rolls, it is subjected to a stretching or drafting force, while, at the same time, the work, including the form and covering material, is fed forwardly with the edge of the form bearing against the guide roll G. The covering material is thus pulled snugly about the form and, as the feeding operation continues, the stretched margin escapes from between the rolls while the rolls concomitantly seize a fresh portion of the marginal material. The marginal material, before escaping from between the rolls, is held in a generally upright position (during the operation the panel is held in inverted position with the ply or layer Q uppermost) so that the margin makes an angle somewhat less than a right angle with that face of the form or core to which the margin is to be attached. The terminal end of the passage 59 in the foot 54 is usually so located that adhesive, expelled from the passage 59 by the air pressure in the melting chamber 41, enters the angle between the stressed margin and that surface of the form to which the covering is to be secured so that, when the margin is pressed down onto the surface of the form, the adhesive will unite it to the form. As the hot adhesive is delivered from the passage in the foot 54, cold air is delivered through the nozzle 62 and contacts the hot fluid adhesive and tends to cool the adhesive very rapidly. However, before the adhesive has set, the margin M^2 is forced inwardly by the folding blade 26 and pressed downwardly by the helical work-impelling rib 17^a of the rotary wiper 17, which always acts at the same distance from the point of application of the stretching stress, the downward pressure exerted by the rotary wiper insuring a firm adhesion of the margin to the surface of the form. The action of the helical wiping element 17^a is such as to prevent the stretched covering material from retracting as it is released from between the rolls. During the operation the operator may depress the treadle 70 as frequently as may be necessary to insure an adequate supply of liquid adhesive through the passage 59. Usually the operator will keep the treadle 70 depressed after the operation starts and until the margin has run out from between the rolls 3 and 4 at the completion of the operation. As soon as the treadle 70 is permitted to rise, the valve 63 closes, cutting off the supply of

air, while at the same time the valve 36 opens to permit the flow of plastic from the reservoir 27 into the chamber 41. Thus, an adequate supply of fluid adhesive in the chamber 41 is insured.

While the cold air delivery nozzle is desirable, it is not essential to the operation of the machine, since thermoplastic adhesives are obtainable which set quickly enough for the purpose, even without the assistance of the cold air jet. While, as above suggested, air is the medium delivered from the nozzle 62, it is contemplated that, when using certain adhesives, other gaseous media than air may be delivered from the nozzle to assist either in the liquefying or in the hardening of the adhesive in accordance with the nature of the adhesive employed. It is further contemplated that air from the supply, controlled by an appropriate valve which operates in timed relation to the other parts, may be delivered, for example, into the right-hand end of the tubular shank or stem 53 (as viewed in Fig. 4) so as to assist in discharging the adhesive from the passage 59, preferably with an arrangement whereby such air will be delivered intermittently at such intervals as may be found desirable.

While one desirable embodiment of the invention has herein been shown and described by way of example, it is to be understood that the invention is broadly inclusive of any and all modifications falling within the scope of the appended claims.

Reference is herein made to applicant's copending application Serial No. 88,402, filed April 19, 1949, now Patent No. 2,576,121, dated November 27, 1951, and to applicant's Patent No. 2,467,385, dated April 19, 1949, and which issued upon his application Serial No. 568,471, filed December 16, 1944.

I claim:

1. In a machine for stretching sheet material over one surface of a form and for securing the marginal portion of the sheet material to another surface of the form and which includes opposing work-gripping elements, at least one of which is a driven roll, between which the marginal portions of the sheet material are gripped while stretching stress is being applied, the point of application of stretching stress being displaced by the action of the roll by infinitesimal amounts along the margin of the sheet material, a wiper element which urges the marginal material, escaping from between the gripper elements, in a direction substantially perpendicular to the direction of stretching stress, and a nozzle for delivering adhesive, arranged to discharge adhesive into contact with the stressed material before it is acted upon by the wiper element, in combination with said nozzle, means defining a normally closed, airtight chamber for adhesive, means for creating a superatmospheric pressure in said chamber, and a conduit for conducting adhesive from the chamber to said nozzle, the nozzle being so located as to deliver adhesive into the space between the lower face of said roll and the last-named surface of the form.

2. In a machine for stretching sheet material over one surface of a form and for securing the marginal portion of the sheet material to another surface of the form and which includes opposing work-gripping elements, at least one of which is a driven roll, between which the marginal portions of the sheet material are gripped while stretching stress is being applied, the point of application of stretching stress being displaced by the action of the roll by infinitesimal amounts along the margin of the sheet material, a wiper element which urges the material, escaping from between the gripper elements, in a direction substantially perpendicular to the direction of stretching stress, and a delivery nozzle for delivering adhesive, arranged to discharge adhesive into contact with the stressed material before it is acted upon by the wiper element, in combination with said nozzle, means defining a normally closed, airtight chamber for thermoplastic adhesive, means for applying heat to said chamber thereby to liquefy the adhesive, a conduit for conveying liquid adhesive from said chamber to said delivery nozzle, means for applying heat to the conduit, a source of air under pressure, a normally closed valve for controlling the supply of compressed air to said chamber, and manually actuable means for opening the valve, the nozzle being so located as to discharge the liquid adhesive into the space below the lower face of the roll and the last-named surface of the form.

3. In a machine for stretching sheet material over one surface of a form and for securing the marginal portion of the sheet material to another surface of the form and which includes opposing work-gripping elements, at least one of which is a driven roll, between which the marginal portions of the sheet material are gripped while stretching stress is being applied, the point of application of stretching stress being displaced by the action of the roll by infinitesimal amounts along the margin of the sheet material, a wiper element which urges the material, escaping from between the gripper elements, in a direction substantially perpendicular to the direction of stretching stress, and a delivery nozzle for delivering adhesive, so arranged as to discharge liquid adhesive for contact with the material before it is acted upon by the wiper element, in combination with said nozzle, means defining a normally closed, airtight chamber for holding a fluid adhesive, means for conducting adhesive from the chamber to the nozzle, a source of compressed air, and a manually controllable valve for determining the delivery of compressed air to said chamber thereby to force the adhesive from the chamber through the conduit, the delivery end of the nozzle being located immediately below the lower face of said roll.

4. In a machine of the class described designed to stretch a cover of flexible sheet material over one surface of a form and for adhesively securing the marginal portion of said cover to another surface of said form and which includes means for applying stretching stress to the marginal portion of the cover, means for pressing said marginal portion into contact with that surface of the form to which it is to be secured, in combination with said stressing and pressing means, a reservoir for fluid adhesive, a rigid conduit communicating at its upper end with the reservoir, the conduit being attached to and supported by the reservoir and having a nozzle at its lower end operative to introduce liquid adhesive between the margin of the covering and the surface of the form to which said margin is to be secured, and means for adjusting the reservoir, thereby to vary the position of the delivery nozzle.

5. In a machine designed to stretch a cover of flexible sheet material over one surface of a form and for adhesively securing the marginal portion of said cover to another surface of said form and which includes means for applying stretching stress to the marginal portion of the cover, means for pressing said marginal portion into

contact with that surface of the form to which it is to be secured, a reservoir for fluid adhesive, in combination with said reservoir, a rigid tubular conduit communicating with the interior of the reservoir, said conduit inclining downwardly from the reservoir and being supported by but with provision for rotary adjustment relatively to the reservoir, the conduit terminating in a nozzle so arranged as to deliver liquid adhesive between the margin of the covering material and that surface of the form to which said margin is to be secured, and adjustable supporting means for the reservoir whereby the position of the reservoir may be varied and thereby concomitantly vary the position of the delivery end of the nozzle.

6. In a machine for stretching covering material over one surface of a form and for securing the marginal portion of the covering material to another surface of the form and which includes opposing work-gripping elements, at least one of which is a driven roll, between which the marginal portion of the covering material is gripped while stretching stress is being applied, the point of application of stretching stress being displaced by the action of the roll along the edge of the form, in combination with said stressing means, a stationary margin folding blade situated close to the work-gripping elements at the delivery side thereof for engaging the marginal material as it escapes from the gripping elements, said blade being so constructed and arranged as to bend the margin inwardly and downwardly toward that surface of the form to which the margin is to be secured, a movable wiper element which engages the marginal material after the latter has been bent in by the stationary folding blade and which urges said margin in a direction substantially perpendicular to the direction of stretching stress, and a nozzle for delivering adhesive, said nozzle being arranged to discharge a quantity of adhesive into the angle between the inner face of the margin and the latter surface of the form just before the material is acted upon by the wiper element.

7. In a machine for stretching covering material over one surface of a form and for securing the marginal portion of the covering material to another surface of the form and which includes opposing work-gripping elements, at least one of which is a driven roll, between which the marginal portion of the covering material is gripped while stretching stress is being applied in a direction heightwise and away from that face of the form to which the margin is to be secured, the point of application of stretching stress being displaced by the action of the roll along the edge of the form, an edge guide, situated adjacent to the work-gripping elements, against which the edge of the form over which the upper is being stretched may be held to steady the form, in combination with said gripping element, a stationary margin-folding blade situated close to the work-gripping elements at the delivery side thereof for engaging the material as it escapes from the gripping elements, said blade being operative to tip the margin inwardly and downwardly toward that face of the form to which the margin is to be secured, a wiper element which urges the partially bent-over marginal material, as it escapes from beneath the folding blade, in a direction substantially perpendicular to the direction of stretching stress, and a nozzle for delivering adhesive arranged to discharge a quantity of adhesive into the angle between the inner face of the stressed material and the last named surface of the form while the margin is being held by the work-gripping elements and before the material is acted upon by the wiper element.

8. In a form covering machine of the class described which includes means for gripping and stressing the margin of a flexible form covering element, means for pressing the margin against that surface of the form to which the margin is to be secured and a nozzle for delivering fluid adhesive for attaching the margin to the form, in combination, means defining a heating chamber for fluid adhesive, means for heating the chamber, a tubular rigid arm, means securing the upper end of the tubular arm to the wall of the heating chamber with provision for rotatably adjusting the arm about its longitudinal axis, means providing a passage affording communication at all times between the interior of the chamber and an axial bore in said arm, a cap member secured to the lower end of said tubular arm, said cap member having a downwardly inclined socket, and a foot having a tubular shank portion which is rotatably adjustable within the socket in said cap and whose interior communicates at all times with the bore in said tubular arm, said foot having a substantially flat undersurface, the free end portion of the foot constituting the delivery nozzle.

9. In a form covering machine of the class described which includes means for gripping and stressing the margin of a flexible form covering element, means for pressing the margin against that surface of the form to which the margin is to be secured and a nozzle for delivering fluid adhesive for attaching the margin to the form, in combination, means defining a heating chamber for thermoplastic adhesive, means for heating the chamber, and nozzle-supporting means fixed to a wall of said heating chamber, said nozzle-supporting means providing a passage leading from the chamber to the nozzle, and means whereby the nozzle may be adjusted in a substantially horizontal direction, and means whereby the nozzle may be tilted to vary the plane of its lower surface.

10. In a machine for stretching covering material over a form and which includes means comprising a constantly rotating gripping element for applying stretching pull to the margin of the covering material, a shaft carrying said gripping element, a horizontally movable slide having bearings for the shaft, a delivery nozzle for supplying adhesive for uniting the margin to the form, and means for pressing the margin into adhering contact with the form, a container for fluid adhesive and a conduit for leading adhesive from the container to the nozzle, in combination, a pair of parallel, rotatable pins projecting laterally from the slide, each pin having an eccentric portion, the container having longitudinally spaced holes which receive the eccentric portions of the respective pins, and means whereby the pins may be rotated, thereby to adjust the position of the container relatively to the slide.

11. In a machine for stretching covering material over a form and which includes means comprising a constantly rotating gripping element for applying stretching pull to the margin of the covering material, a shaft carrying said gripping element, a horizontally movable slide having bearings for the shaft, a delivery nozzle for supplying adhesive for uniting the margin to the

form and means for pressing the margin into adhering contact with the form, in combination, a container for fluid adhesive, the container being carried by the slide and being movable bodily with the latter, and rigid means connecting the nozzle to the container whereby the nozzle partakes of the movement of the slide.

12. In a machine for stretching covering material over a form and which includes means comprising a constantly rotating gripping element for applying stretching pull to the margin of the covering material, a shaft carrying said gripping element, a horizontally movable slide having bearings for the shaft, a delivery nozzle for supplying adhesive for uniting the margin to the form, and means for pressing the margin into adhering contact with the form, in combination, a holder for fluid adhesive, said holder comprising supporting arms, each arm having a horizontal hole, a rotatable pin received in each hole, each pin having threaded engagement with a socket in the slide and projecting laterally from the latter, means whereby each pin may be rotated in its socket, that portion of each pin which is received in the hole in the respective arm being eccentric to that portion of the pin which turns in the socket in the slide whereby rotation of the pins varies the position of the fluid-holding means relative to the slide, and a rigid tube fixed at its upper end to the adhesive-holder and to whose lower end the delivery nozzle is secured.

13. A form covering machine of the class described which includes means comprising a rotary roll for gripping and applying stretching force to the margin of the covering material, the axis of the roll being inclined to the plane of that surface of the form to which said margin of the covering material is to be secured, in combination a form-contacting foot operative to hold the form down in opposition to the stretching force, said foot being located directly below the lower end of said roll, the foot having a substantially flat undersurface for contact with that surface of the form to which the margin of the covering is to be secured, the foot being of wedge shape in transverse vertical section so that it may lie in the angle between said surface of the form and the bottom face of the roll, the foot also constituting the delivery nozzle and having an orifice for discharging fluid adhesive for uniting the margin of the covering to the form.

JACOB S. KAMBORIAN.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
2,152,732	Dreymann	Apr. 4, 1939
2,251,284	Kamborian	Aug. 5, 1941
2,287,829	Bryan	June 30, 1942
2,429,306	Carr	Oct. 21, 1947
2,438,917	Kamborian	Apr. 6, 1948
2,467,385	Kamborian	Apr. 19, 1949

FOREIGN PATENTS

Number	Country	Date
644,634	Germany	May 10, 1937