United States Patent

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[45] Patented **Mar. 9, 1971**
[73] Assignee **McCall Corporation New York, N.Y.**

[54] **APPARATUS FOR MAKING LETTERPRESS PLATES**
6 Claims, 10 Drawing Figs.

[52] **U.S. Cl.** **101/401.1,** 264/327, 100/93, 18/22
[51] **Int. Cl.** **B41n 1/10**
[50] **Field of Search** ..... 264/327; 101/401.1; 18/17 (H), 5.3 (H); 101/9, 27, 31, 32; 100/93; 156/583; 18/19 (Partial), 22, 23, 53 (Inquired)

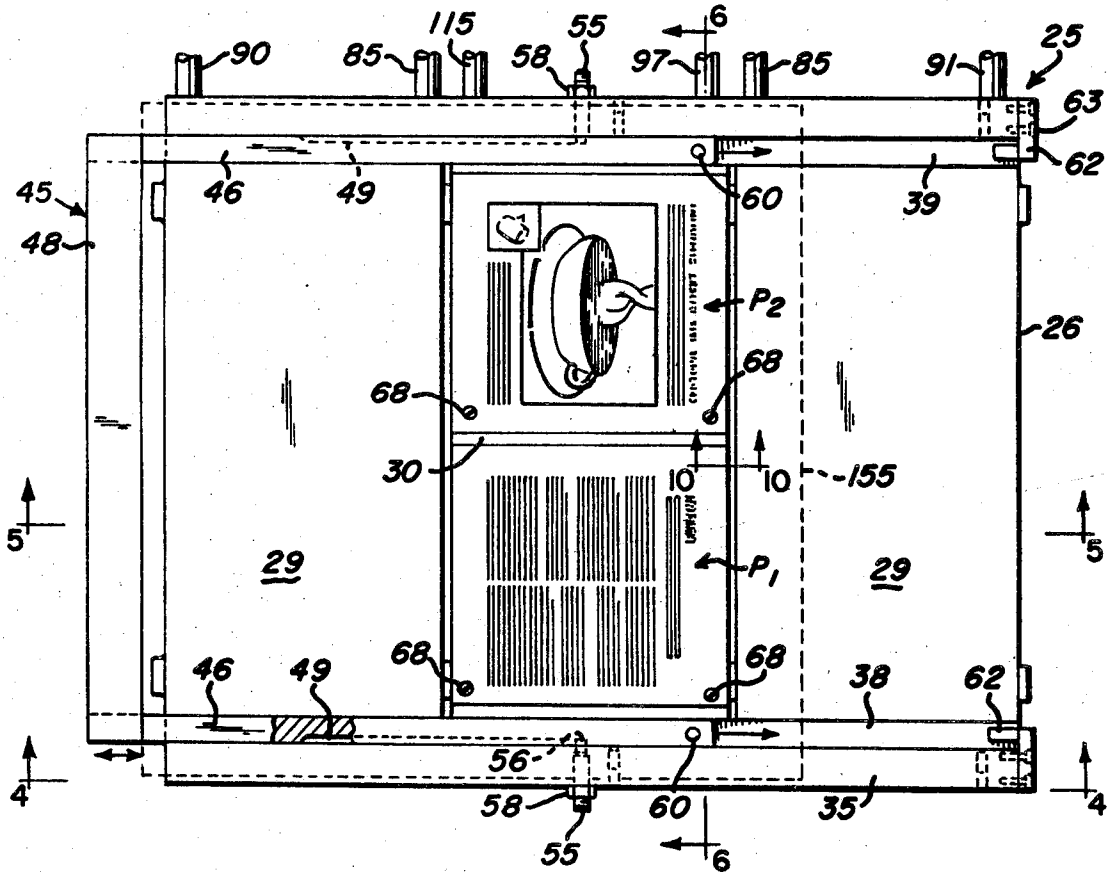
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ABSTRACT: A hydraulic press supporting a lower press member including a center and end sections each having an internal passageway and with an engraved master plate mounted on the center section, an automatically controlled system for circulating cooling fluid through the passageways in the end sections and alternately circulating cooling and heating fluid through the passageway in the center section for preheating and cooling the plates, a thermoplastic sheet of material pressed against the preheated plate by an upper press member having a resilient blanket and held until the plate and sheet are cooled, and a frame slidably mounted on the lower press member for shifting the sheet a predetermined distance to form a flexible mat having a pair of identical impressions in precise registration for use in producing a two-on plate for a letterpress.



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3 Sheets-Sheet 1

FIG-1

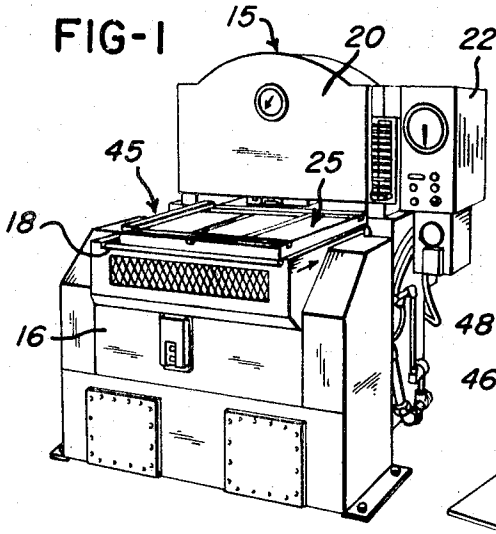


FIG-2

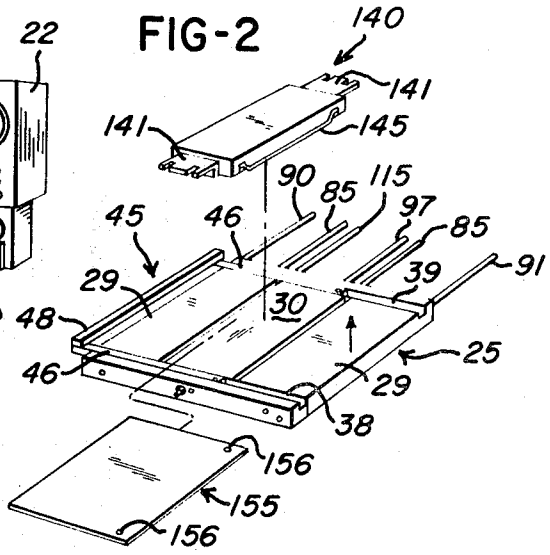
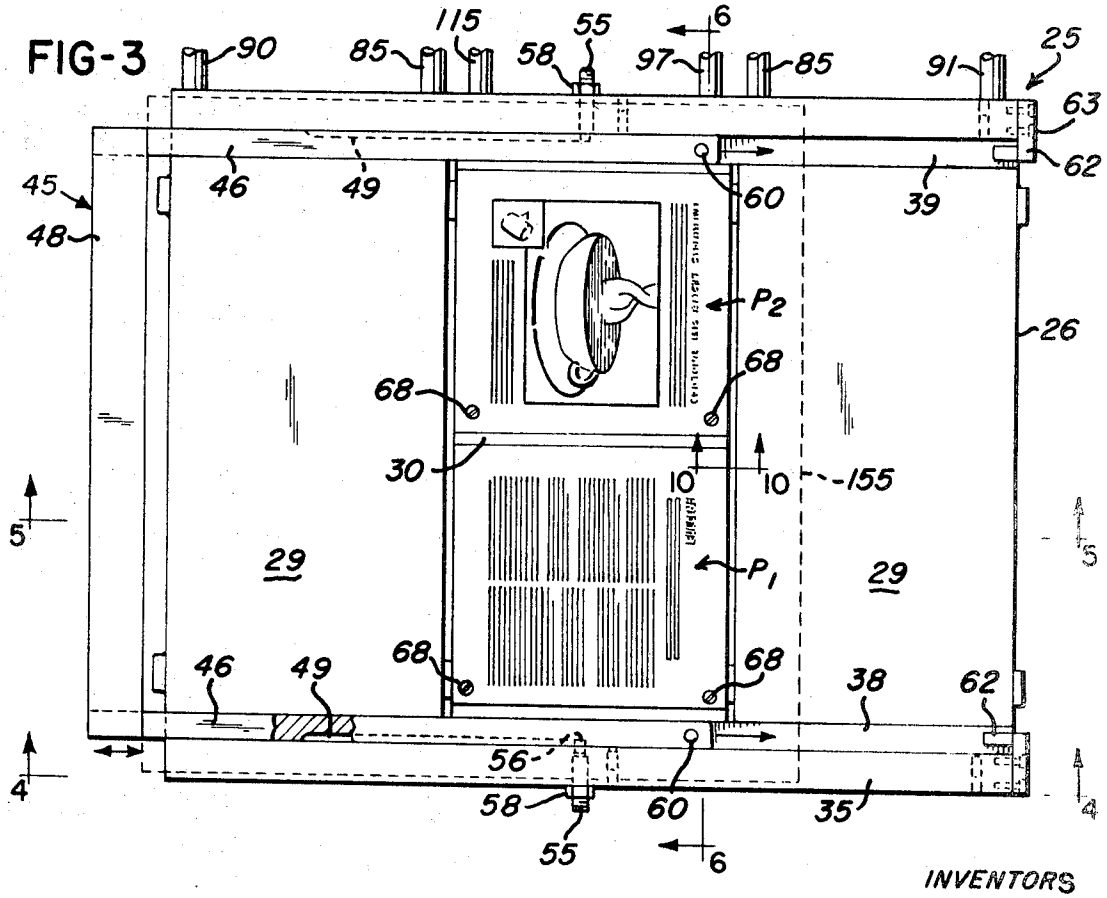


FIG-3



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FIG-4

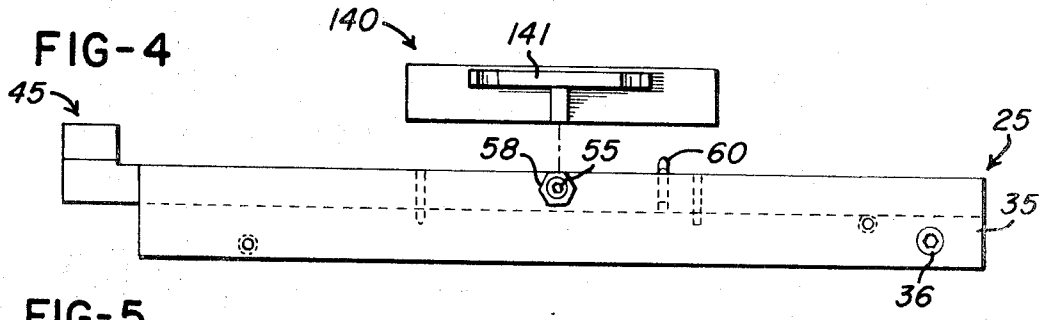


FIG-5

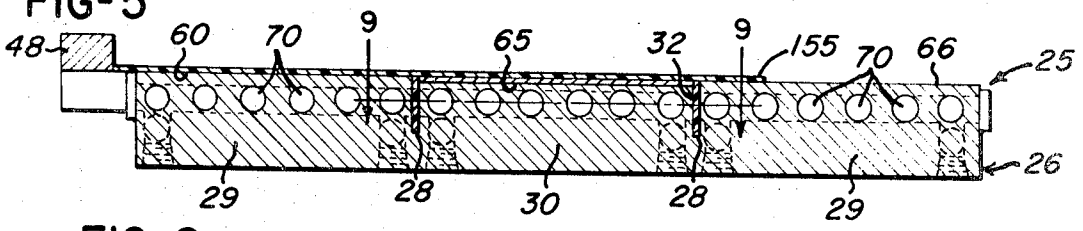


FIG-6

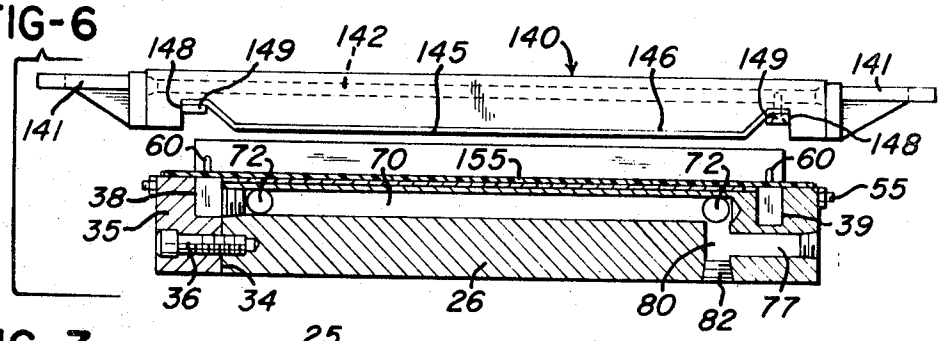


FIG-7

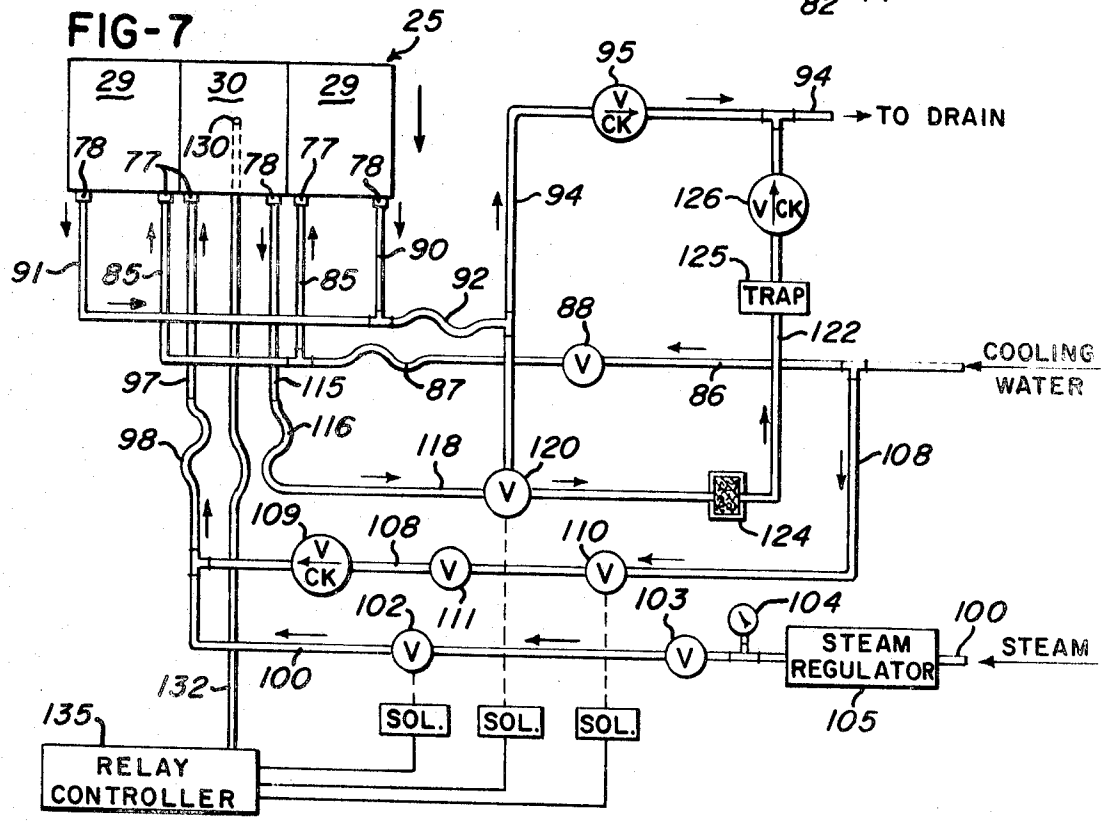


FIG-8

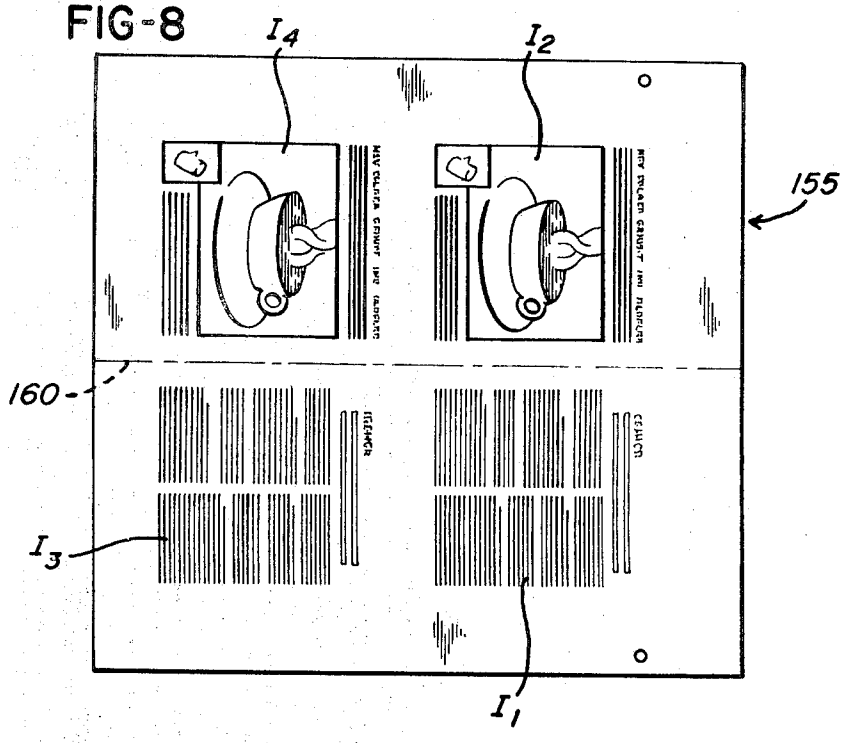


FIG-9

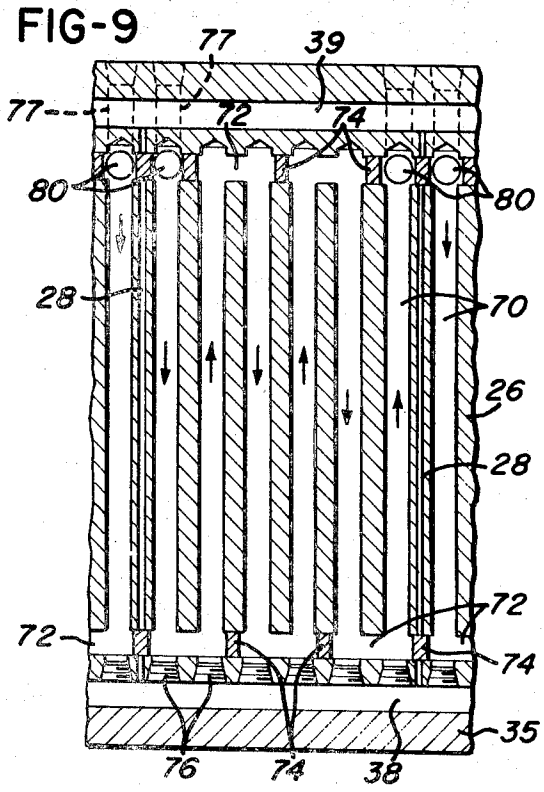
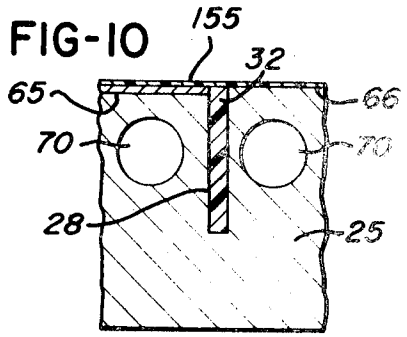


FIG-10



APPARATUS FOR MAKING LETTERPRESS PLATES

BACKGROUND OF THE INVENTION

In the production of part-cylindrical plates for mounting on the rolls of a letterpress, a flexible matrix or mat is made by first preheating a flat original engraved plate within a device commonly referred to as a clamshell having internal passageways through which a heating fluid such as steam is circulated. After preheating, the engraved plate is removed from the clamshell and a sheet of vinyl is placed on the mat with an overlay of a resilient blanket, and the sandwiched assembly of the plate, vinyl sheet and blanket is inserted within a hydraulic press where substantial pressure is applied to mold in the vinyl sheet an impression of the engraved plate. The sheet and the engraved plate are then cooled within the press while pressure is maintained to form a flexible vinyl mat. One or more metal layers are electrolytically deposited on the mat and the thin sheet of deposited metal is then separated from the vinyl sheet to form a flexible electrotype which is laminated to a precurved reinforcing mat and this laminated assembly is trimmed to form the letterpress plate.

It has been found desirable to avoid the transfer operation of the preheated engraved plate from the clamshell to the high pressure press after adding the vinyl sheet and blanket to increase efficiency in producing a mat and to avoid heat loss from the plate during the transfer. Furthermore, for efficiently printing some smaller books or magazines, it is frequently desirable to form a mat having a pair of identical impressions in precise registration for producing a "two-on" letterpress plate on which two impressions are spaced circumferentially in relation to the roll of the letterpress on which the plate is mounted.

SUMMARY OF THE INVENTION

The present invention is directed to an improved method and apparatus for efficiently producing a flexible vinyl mat and which is especially suited for forming a two-on mat or a four-on mat having corresponding pairs of identical impressions all in precise registration. Thus the method and apparatus of the invention provide for efficiently constructing either two-on or four-on letterpress plates and thereby substantially reduce the time required to mount and align a set of plates on the plate cylinders of the letterpress for a particular printing job.

According to a preferred embodiment of the invention, a two-on mat is produced by securing an engraved master plate to the center section of a flat lower press member which slidably supports a U-shaped frame to which is secured a sheet of vinyl. Cooling fluid is circulated through passageways formed within each end section of the press member and cooling and heating fluid are alternately circulated through a passageway within the center section directly under the engraved plate.

The lower press member, master plate and the vinyl sheet are carried into a hydraulic press where a portion of the vinyl sheet is held in light contact with the engraved face of the master plate by a resilient blanket mounted on an upper press member while the master plate and vinyl sheet are preheated by circulating steam through the center section of the lower press member. After the master plate reaches a predetermined temperature, the sheet of vinyl is pressed against the engraved face of the plate by raising the lower press member toward the upper press member.

As the high pressure is being applied, cool water is circulated through the center section of the lower press member in place of the steam to cool the corresponding portion of the vinyl sheet while the remaining portion of the vinyl sheet is maintained cool by the water being circulated through the adjacent end section of the lower press member. After one impression is made in the vinyl sheet, the sheet is shifted a predetermined distance by sliding the frame laterally and a second impression is formed within the vinyl sheet by repeating the above procedure. As a result, two identical impressions can be quickly formed within the sheet with the impression disposed in precise registration.

Other features and advantages of the invention will be apparent from the following description, the accompanying drawings and the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of apparatus for forming a flexible mat in accordance with the invention;

FIG. 2 is a perspective view of a vinyl sheet and the upper and lower press members forming a part of the apparatus shown in FIG. 1;

FIG. 3 is a plan view of the lower press member with two engraved plates mounted thereon;

FIG. 4 is an elevation view of the upper and lower press members as taken generally on the line 4–4 of FIG. 3;

FIG. 5 is a section of the lower press member taken generally on the line 5–5 of FIG. 3;

FIG. 6 is a side elevational view of the upper press member and a section of the lower press member taken generally on the line 6–6 of FIG. 3;

FIG. 7 is a schematic flow diagram showing the circulation of heating and cooling fluid through the lower press;

FIG. 8 is a view of a typical mat formed in accordance with the invention and having two sets of two-on impressions;

FIG. 9 is a fragmentary section of the lower press member as taken generally on the line 9–9 of FIG. 5; and

FIG. 10 is an enlarged fragmentary section as taken on the line 10–10 of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 shows a hydraulic molding press 15 of the type manufactured by Ostrander-Seymour Company, Melrose Park, Illinois, and generally includes a base 16 which supports a table 18 movable horizontally between an extended position (FIG. 1) and a retracted position (not shown) under a head portion 20 where the table is moved vertically by a hydraulic cylinder (not shown) mounted on the base 16. An automatic recorder controller 22 is mounted on the head portion 20 and is connected to control the horizontal and vertical movements of the table 18 in accordance with a preselected temperature sequence as explained later.

In accordance with the invention, a lower press member 25 in the form of a rectangular plate is mounted on the upper surface of the table 18. The press member 25 includes a base portion 26 (FIG. 6) having a pair of parallel spaced slots 28 (FIG. 5) which divide the base portion 26 into a pair of end sections 29 on opposite sides of a center section 30. A strip 32 of insulation material, such as a strip of polytetrafluoroethylene, is mounted within each of the slots 28 as shown in FIG. 10.

The base section 26 of the press plate 25 is provided with a longitudinal flat edge surface 34 (FIG. 6) to which an edge portion 35 is secured by a series of screws 36. A longitudinally extending slot 38 of rectangular cross section is formed within the edge section 35 having the surface 34 as one side, and a corresponding parallel spaced slot 39 formed within the base portion 26. A U-shaped frame 45 (FIG. 3) includes a pair of parallel spaced legs 46 which are slidably mounted within the corresponding slots 38 and 39 within the press member 25. The legs 46 are rigidly connected by a bar 48 and each leg is provided with a longitudinally extending slot 49.

A threaded stud 55 FIGS. 3 and 6) extends through the base portion 26 and has an inner end portion 56 which is received within the corresponding slot 49. Another threaded stud 55 extends through the edge portion 35 of the lower press member 25 and has an inner portion 56 received within the slot 49 of the other leg 46 so that the studs 55 cooperate to retain the frame 45 on the lower press member 25. A lock nut 58 is mounted on each of the studs 55 for securing the studs rigidly to the lower press member after it is properly adjusted.

A vertically extending pin 60 (FIG. 3) is mounted on the end portion of each leg 46 of the frame 45, and a pair of L-

shaped stop members 62 are mounted on one end of the press member 25 by screws 63 and extend into the slots 38 and 39 for engaging the end surfaces of the legs 46 and thereby limit the movement of the frame 45 to the right (FIG. 3). The studs 55 limit the movement of the frame to the left.

Referring to FIGS. 5 and 10, the center section 30 of the lower press member 25 has a flat top surface 65 which is spaced slightly below the corresponding top surface 66 of the adjacent end sections 29 and forms a recess between the insulation strips 32 for receiving two original or master plates P_1 and P_2 each having an engraved face. Each master plate is secured to the center section 30 by a pair of screws 68 and the engraved face of each master plate projects slightly above the top surfaces 66 of the end sections 29 by approximately .010 inch.

Referring to FIG. 9, each end section 29 and the center section 30 of the press member 25 is provided with a series of parallel spaced passageways 70 which extend laterally between the slots 38 and 39 and are connected on opposite ends by longitudinally extending passageways 72. A series of plugs 74 are press-fitted into the passageways 72 and a series of threaded plugs 76 close the corresponding ends of the passageways 70 to form a serpentinelike flow path between an inlet port 77 and an outlet port 78. Referring to FIG. 6, the inlet and outlet ports are formed within the press member 25 under the rail 39 and are connected to the adjacent passageways 72 by short vertically extending passageways 80 (FIG. 6) which are closed at the bottom of the press member by corresponding plugs 82.

Referring to FIG. 7, the inlet ports 77 of the end sections 29 of the press member 25 are connected by lines 85 to a water supply line 86 through a flexible line 87 and including a manual shutoff valve 88. The discharge port 78 of each end section 29 are connected by lines 90 and 91 through a flexible line 92 to a drain line 94 having a check valve 95. The inlet port 77 of the center section 30 of the press member 25 is connected by a line 97 and a flexible line 98 to a steam supply line 100 in which is mounted solenoid control valve 102, a manual shutoff valve 103, a pressure gauge 104 and a pressure regulator 105. The lines 97 and 98 are also connected to a water supply line 108 having a check valve 109, a solenoid controlled valve 110 and a manual shutoff valve 111. The water supply line 108 connects with the water supply line 86.

The outlet port 78 of the center section 30 is connected by a line 115 and flexible line 116 to a drain line 118 which is normally connected to the drain line 94 through a three-way solenoid controlled valve 120. A condensate line 122 connects the valve 120 to the drain line 94 on the opposite side of the check valve 95 and is provided with a strainer 124, a steam trap 125 and a check valve 126. The solenoid controlled valves 102, 110 and 120 are actuated by the recorder controller 22 which is controlled by a thermocouple 130 mounted within the center section 30 of the press member 25. Leads 132 connect the thermocouple 130 to the controller 135.

Referring to FIGS. 2, 4 and 6, a stationary upper press member 140 in the form of a rectangular plate, is mounted within the head 20 of the press 15 and is disposed directly above the center section 30 of the lower press member 25 when the table 18 is retracted. The upper press member 140 includes end mounting flanges 141 and may be provided with internal passageways 142 (FIG. 6) corresponding to the passageways 70 and 72 within the center section 30 of the lower press member 25, for heating and cooling the upper press member simultaneously with the center section 30. Experimentation has shown, however, that the additional heating and cooling of the upper press member 140 is not necessary to obtain satisfactory performance of the apparatus.

A resilient rectangular blanket 145, preferably of a rubber-fabric material and having a uniform thickness, extends over the bottom flat surface 146 of the upper press member 140. The blanket has opposite end portions which extend into corresponding grooves 148 formed within the preset member and the end portions are secured by corresponding clamping bars 149.

To produce a mat with the apparatus constructed in accordance with the invention, a sheet 155 FIGS. 2 and 3) of thermoplastic material such as vinyl and having a pair of prepunched holes 156, is mounted on the frame 45 so that the pins 60 project into the holes 156. The valve 88 is opened so that cooling water is continuously circulated through the end sections 29 of the lower press member 25 thereby cooling the top surfaces 66 of the end sections 29.

The recorder controller 22 is manually actuated to initiate a predetermined cycle which begins with retracting the table 18 under the head 20. The table 18 and lower press member 25 are then moved upwardly with relatively light pressure so that the sheet 155 of vinyl lightly contacts the blanket 145 on the upper press member 140 and is thereby held in light contact with the engraved faces of the master plates P_1 and P_2. When the table is retracted, it actuates a switch which opens the solenoid controlled valve 102 and closes the valve 110. When the controller 22 senses a temperature rise through the thermocouple 130, valve 120 is actuated to connect return line 118 to the condensate line 122 so that steam is circulated through the center section 30 of the lower press member 25 which raises the temperature of the master plates P_1 and P_2 and the overlying portion of the vinyl sheet 155.

When the center section 30 of the lower press member 25 reaches a predetermined curing temperature, which can be adjustably set, the thermocouple 130 signals the controller 22 which energizes the hydraulic cylinder within the press 15 so that it applies full force upwardly on the table 18. As a result, the engraving faces of the plates P_1 and P_2 are pressed into the vinyl sheet thereby producing corresponding impressions I_1 and I_2 within the sheet 155 as illustrated in FIG. 8 on the right-hand portion of the sheet 155.

Substantially simultaneously with the application of full pressure on the lower press member 25 against the upper press member 140, which produces a force on the order of 12 tons, the recorder controller 22 closes the valve 102, opens the valve 110 and actuates the valve 120 so that the line 118 is connected directly to the drain line 94. Thus the temperature of the center section 30 of the lower press member 25 and the master plates P_1 and P_2 and the vinyl sheet 155 begins to drop. When the temperature of the center section 30 reaches a predetermined lower limit, which can be adjustably set, the thermocouple 130 signals the controller 22 which actuates the hydraulic cylinder in the press 15 to lower the table 18 and thereby release the pressure between the upper and lower press member, after which the table 18 automatically returns to its extended position as shown in FIG. 1.

After one set of impressions I_1 and I_2 are formed within the vinyl sheet 155 from the master plates P_1 and P_2, the frame 45 and sheet 155 are moved to the right (FIG. 3) until the ends of the legs 46 engage the stop members 62. In this position, the right-hand portion of the vinyl sheet 155 which has the impressions I_1 and I_2, is positioned adjacent the top surface 66 of the right end section 29 of the lower press member 25 and the left end portion of the sheet is positioned over the engraved faces of the master plates P_1 and P_2.

The recorder controller 22 is actuated again so that the operational steps of the cycle described in the preceding paragraphs are repeated automatically which results in producing a sheet 155 having another set of impressions I_3 and I_4 (FIG. 8) in precise registration to the corresponding first set of impressions I_1 and I_2. The sheet 155 is then cut or sheared along the line 160 to produce two mats each having a pair of identical impressions in precise registration. Each mat is then used to produce a two-on letterpress plate using the same procedure as mentioned above for producing a plate with a single impression.

From the drawings and the above description, it can be seen that the apparatus and method for producing a mat in accordance with the invention provides several desirable features and advantages. For example, by connecting the center section 30 of the lower press member 25 to corresponding water and steam supply and discharge lines having automatically controlled valves, the center section 30 may be heated

within the press 15 for preheating the master plates and the vinyl sheet and then cooled while full pressure is applied between the press members to produce a mat without requiring the transfer of the master plate from a preheating clamshell to a molding press. As a result, the time required for forming an impression within the vinyl sheet is significantly reduced. In addition, the cooling under pressure prevents shrinkage of the image.

The slidable frame 45 and its cooperating cooperation with the three section lower press member 25 also provide important features of the invention. That is, the frame 45 provides for shifting the vinyl sheet 155 by a precise predetermined distance after one impression is made so that a second identical impression can be formed within the sheet in precise registration with the first impression. The continuous cooling of the end sections 29 is effective to prevent the adjacent portion of the overlying half portion of the vinyl sheet from being heated when the other half portion is being heated and pressed against the face of the master plate, and thereby prevents warping and distortion of the adjacent portion of the vinyl sheet.

Instead of producing two "two-on" mats as shown in FIG. 8, it can be seen that the master plates P_1 and P_2 could be formed integrally or rigidly connected with the corresponding engraved faces in precise registration so that a "four-on" mat could be produced with all of the impressions in precise registration. A typical application for a "four-on" mat would be for producing a letterpress plate having "two-on" double page impressions. By providing an automatic control system as shown in FIG. 7 for circulating steam or water through the center section 30 of the lower press member 25, and controlling the operation of the system by a thermocouple which senses the temperature of the center section 30, each mat receives the same treatment so that the impressions on each mat of a color set will have precisely the same registration and thereby substantially reduces the time for mounting and positioning the plates on the plate cylinders of the letterpress.

While the form of apparatus and process herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise apparatus and process, and that changes may be made therein without departing from the scope of the invention.

I claim:

1. Apparatus for use in making a multiple impression plate for a letterpress, comprising a first press member having a surface for receiving a master plate with a predetermined face, a frame member slidably mounted on said first press member and having means for engaging a sheet of thermoplastic material, stop means effecting precise predetermined movement of said frame member relative to said first press member to provide for selective shifting of said sheet between first and second positions to locate first and second portions of said sheet over said face of said master plate, means for preheating each of the sheet portions disposed over said face, a second press member spaced from said first press member, press means providing relative linear movement between said first and second press members for pressing each portion of the sheet against said face to mold an impression within each portion of the sheet, and means for cooling each portion of the sheet to form a mat having two identical impressions each conforming to said face of said master plate and arranged in precise predetermined registration.

2. Apparatus as defined in claim 1 including means defining a fluid passageway within said first press member in close spaced relation to said surface, automatic control means for alternately circulating heating and cooling fluid through said passageway to effect said heating and cooling of each portion of the sheet, and means for sensing the temperature of said first press member to provide for switching between heating and cooling fluid in response to predetermined temperature of said master plate said sheet.

3. Apparatus as defined in claim 1 wherein said frame includes parallel spaced legs, means defining parallel spaced slots within said first press member and receiving said legs, and a pin projecting upwardly from each said leg for receiving a corresponding hole formed within said sheet to locate said sheet in fixed relation to said frame.

4. Apparatus as defined in claim 1 wherein said first press member includes a center section between opposite end sections, said center section having said surface for receiving said master plate and including means defining a fluid passageway, means defining a separate fluid passageway within each said end section of said press member, said frame member being effective to position selectively each portion of the sheet over said center section and over one of said end sections, means for selectively circulating heating and cooling fluid through said passageway within said center section, and means for circulating cooling fluid through said passageway within each said end section.

5. Apparatus as defined in claim 4 wherein said passageway within each said section has a serpentinelike configuration to direct fluid in such a manner to provide uniform heating and cooling of the corresponding said section of said first press member.

6. Apparatus as defined in claim 4 including means defining a slot within said first press member between adjacent said sections to minimize heat transfer between said sections.