The following statement is a full description of this invention, including the best method of performing it known to us:

X730-73-1D-19P.O.
This invention relates to a heat control which is particularly adapted for use in moulding flat pieces of fabric into three dimensional shapes for use in breast cups, brassieres, swim suits and other garments or parts thereof.

The invention relates more particularly to fabric moulding operations in which the fabric is heated rather than the moulds. In the prior art, only one side of the fabric is heated. The prior art also teaches the application of the same amount of heat across the entire area of the fabric. This may result in over-heating the interior area, due to the dissipation of heat around the edges.

The present invention provides heat control for fabric moulding in which heat is applied to both sides of the fabric simultaneously. The application of heat may be controlled so that unequal amounts of heat may be applied to the opposite sides of the fabric, as may be necessary or desirable for various types of moulding and/or laminating operations.

The invention may also provide for the controlled application of unequal amounts of heat to the interior and exterior portions of the fabric in order to compensate for the dissipation of heat which naturally occurs along the side edges. The unequal application of heat accordingly results in the necessary and desirable uniform heating across the entire surface of the material, to provide uniform moulding results.

According to the present invention, therefore, a heater rack is provided for use in moulding flat pieces
of fabric into three dimensional shapes for use in garments, in which mould parts are mounted for movement into a closed position with complementary mould parts to mould fabric disposed between said mould parts, the improvement comprising a heater rack for heating both sides of said fabric simultaneously, said heater rack being mounted for sliding horizontal movement between an operating position and a retracted position, said heating rack having an upper portion and a lower portion, said upper portion being disposed directly above said fabric and extending parallel thereto and said lower portion being disposed directly below and extending parallel to said fabric when said heater rack is in said operating position, said heater rack in retracted position being moved horizontally completely away from said fabric to permit said mould parts to close and mould said fabric, and separate control means for controlling the heat supply to said upper and lower portions of said rack in accordance with varying heat requirements of the fabric being moulded.
The invention will be described further, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a side elevational view of a moulding press with heating rack in retracted position, the operating position being shown in phantom lines;

Fig. 2 is a sectional view on line 2-2;

Fig. 3 is a front elevational view of the control panel.

A preferred embodiment which has been selected to illustrate the invention comprises a conventional hydraulic press 10. A plurality of male moulds 11 are mounted on a support member 12 which is mounted for vertical reciprocal movement by a hydraulic ram 13, which has an upper end of its piston connected to the support member 12.
A plurality of complementary stationary female moulds 14 are mounted directly above the male moulds 11. A fabric frame 15 extends horizontally between the moulds 11 and 14 and is adapted to hold one or more linings of fabric 16 for moulding. The frame 15 is mounted for vertical reciprocal movement on guide rods 17. Coil springs 18 mounted on the guide rods 17 exert pressure urging the frame 15 and fabric 16 upwardly when the moulds are closed.

A substantially U-shaped heater rack 19 is mounted for sliding reciprocal horizontal movement between two positions, in one of which its upper portion 20 and lower portion 21 are disposed directly above and beneath the fabric 16 and extend substantially parallel thereto. This is the heating or operating position, in which heat is applied to the fabric 16 to prepare it for the moulding operation.

The heater rack 19 is moved from this position to a retracted or non-operating position in which it is slidably moved horizontally outwardly so that the moulds can be closed to perform the moulding operation after the fabric 16 has been sufficiently heated.

The upper portion 20 and lower portion 21 of the heater rack 19 have a plurality of electrically operated U-shaped heating rods, which are best shown in Fig. 2 of the drawings. These rods comprise narrow rods 22, two of which are disposed adjacent to each end of the heater rack 19 and wider rods 23, which extend across the inner portion of the heater rack 19. All of the rods are spaced from and extend parallel to each other.
The purpose of the heater rod arrangement shown is to provide a greater amount of heat adjacent to the side edges of the heater rack 19 in order to compensate for heat dissipation which naturally occurs in these areas. This arrangement prevents the interior areas of the fabric 16, which have little or no heat dissipation, from being undesirably overheated prior to the moulding operation.

Reciprocal movement of the heater rack 19 is effected by the operation of a hydraulic cylinder 24, which is mounted on the upper part of the press 10. The end of its piston 25 is connected to a vertically directed arm 26 which is in turn connected to the heater rack 19. A shock absorber 27 is provided to cushion the movement of the heater rack 19.

In use, the fabric materials 16 to be heated are placed on the fabric frame 15. The cylinder 24 is then energized to move the heater rack 19 to its operating position. Heat is then applied to the heating rods 22 and 23 and transferred by radiation to the fabric 16. After the fabric 16 has been sufficiently heated, the heater rack 19 is retracted and the hydraulic ram 13 energized to move the support member 12 and male moulds 11 upwardly. The male moulds 11 engage the fabric 16 as they move upwardly and carry the fabric 16 and frame 15 upwardly so that the fabric 16 is held between the closed moulds.

The moulds remain closed a short period of time while the moulding operation is completed. The ram 13 is then released to retract its piston and thereby move the support member 12 and male moulds 11 back down to their
normal positions. The frame 15 moves back to its normal position and the moulded fabric 16 is then removed from the frame 15.

Suitable micro-switches are provided to prevent the ram 13 from operating until the heater rack 19 is in its fully retracted position and to prevent the heater rack 19 from moving to operating position until the moulds are fully open.

The intensity and duration of heat which is applied to the fabric 16 is controlled by means of an electrical control panel 30. The control panel 30 includes a control 31 for controlling the amount of heat which is supplied to the upper portion 20 of the heater rack 19. A separate control 32 controls the amount of heat supplied to the lower portion 21 of the heater rack 19. A control 33 controls the amount of heat supplied to the outer heating rods 22. A separate control 34 controls the amount of heat applied to the inner heating rods 23.

A timing control 35 controls the amount of time the heating rack 19 is held in operating position applying heat to the fabric 16. An indicator light 37 is also provided.
THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS

1. A heater rack for use in moulding flat pieces of fabric into three dimensional shapes for use in garments, in which mould parts are mounted for movement into a closed position with complementary mould parts to mould fabric disposed between said mould parts, the improvement comprising a heater rack being adapted to heat both sides of said fabric simultaneously, said heater rack being mounted for sliding horizontal movement between an operating position and a retracted position, said heater rack having an upper portion and a lower portion, said upper portion being disposed directly above said fabric and extending parallel thereto and said lower portion being disposed directly below and extending parallel to said fabric when said heater rack is in said operating position, said heater rack in retracted position being moved horizontally completely away from said fabric to permit said mould parts to close and mould said fabric, and separate control means for controlling the heat supply to said upper and lower portions of said rack in accordance with varying heat requirements of the fabric being moulded.

2. The heater rack described in claim 1, each of said upper and lower portions of said heater rack having a plurality of elongated heating rods, said rods being spaced in closer proximity to each other in outer areas of said rack than in the inner area thereof to apply more heat to the outer areas of said fabric to compensate for heat dissipation in said outer areas.

3. The heater rack described in claim 1 or 2, and
separate control means for controlling the heat supply
to the outer and inner areas of said rack.

4. In a moulding press, a heater rack substantially
as hereinbefore described with reference to and as illus-
trated in the accompanying drawings.

Dated this 3rd day of May, 1973.

INTERNATIONAL FABRIC MOLDERS, INC.
By their Patent Attorney:

of GRIFFITH, HASSEL & FRAYER.