Oct. 21, 1952 G. A. HAYES ET AL 2,615,116

MEANS FOR SETTING NYLON

Filed Oct. 12, 1949 4 Sheets-Sheet 1

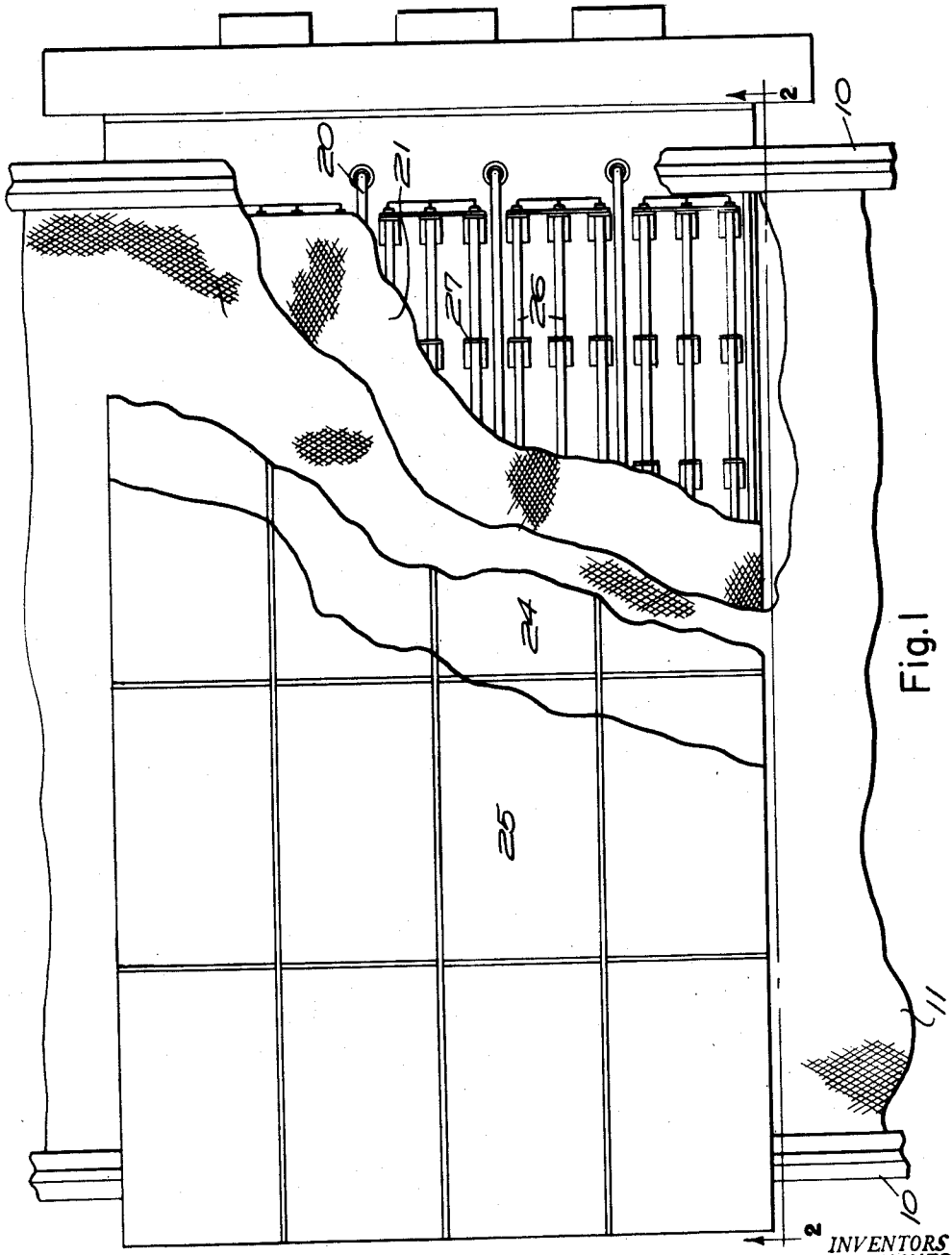


Fig. 1

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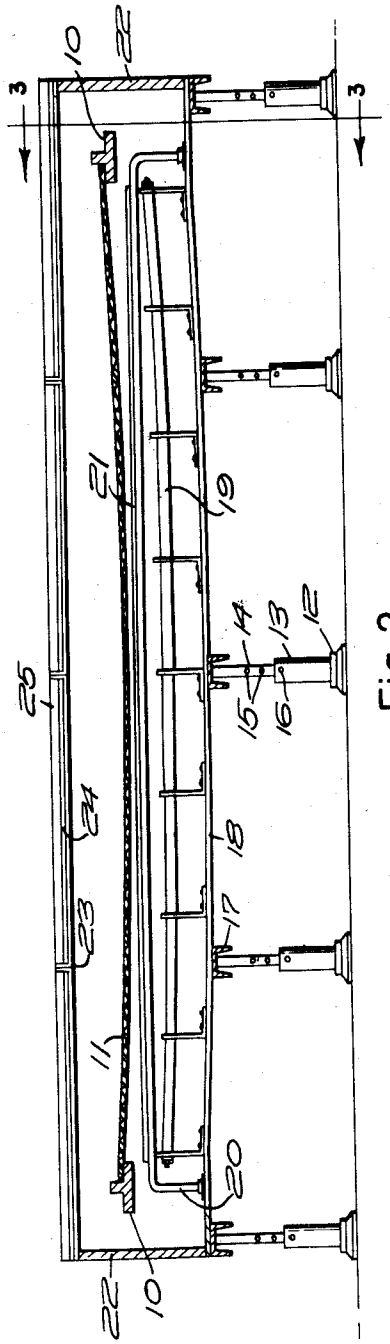


Fig. 2

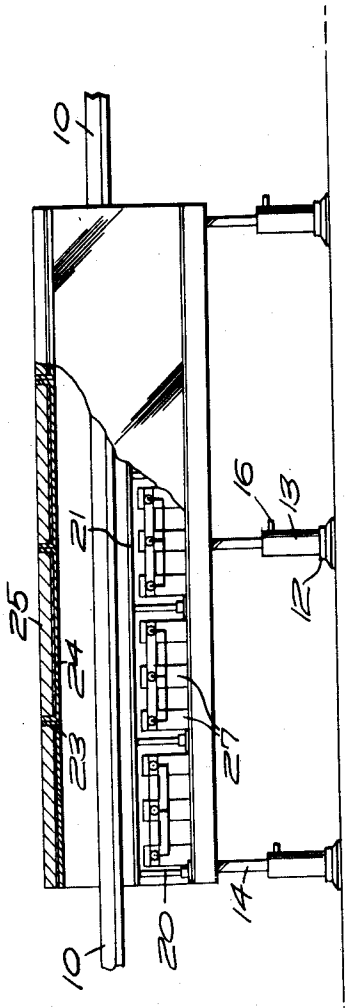


Fig. 3

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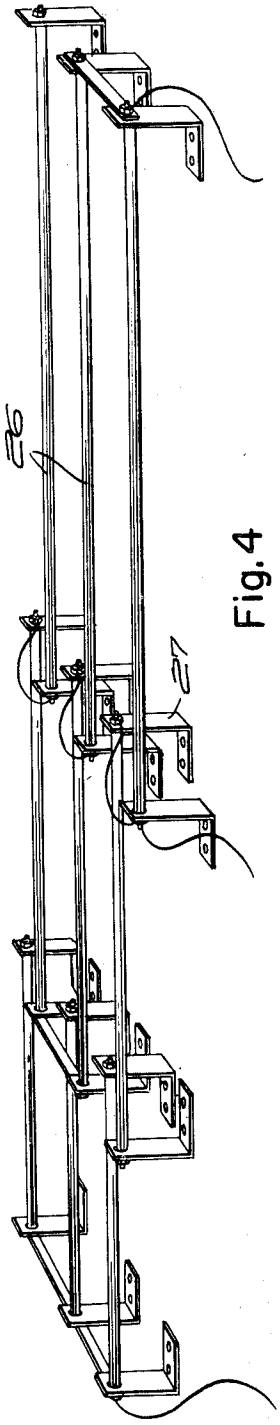


Fig. 4

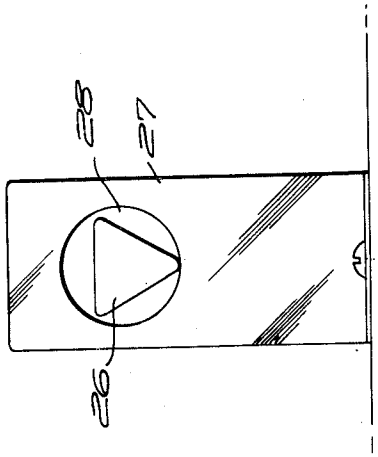


Fig. 5

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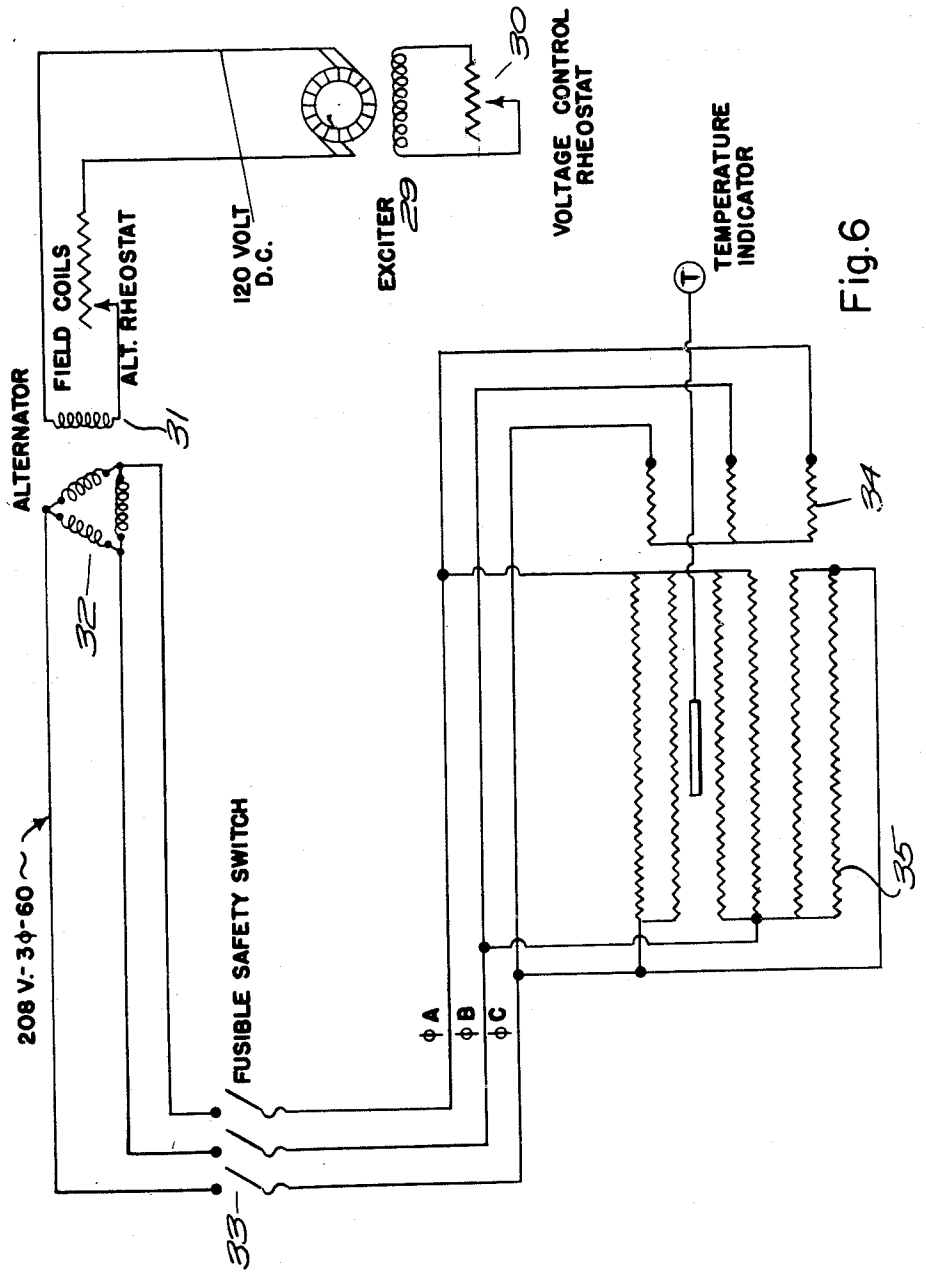


Fig.6

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2,615,116

MEANS FOR SETTING NYLON

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8 Claims. (Cl. 219—34)

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Our present invention relates to the textile art, and more particularly to a novel apparatus for setting nylon.

In the finishing of nylon cloth, and more especially nylon lace, it has been found that the material is subject to crinkling and curling due to the shrinkage and resiliency of the material. It is desirable to avoid ironing, and nylon lace and other nylon cloth is therefore treated with heat during the finishing operation. It has been found that treatment at certain temperatures will set the nylon and remove its resiliency to a degree that it will remain limp after washing and will require no ironing. This is especially desirable of nylon lace used for trimming on women's undergarments where cotton lace always requires ironing to flatten out. The treated nylon lace need only be washed and hung up to dry.

The principal object of the present invention is, therefore, to provide a novel apparatus and a novel process for the setting of the nylon by the application of heat.

With the above and other objects and advantageous features in view, our invention consists of a novel arrangement of parts and a novel process, more fully disclosed in the detailed description following, in conjunction with the accompanying drawings, and more particularly defined in the appended claims.

Referring to the drawings,

Fig. 1 is a plan view, partly broken away, of our novel setting apparatus;

Fig. 2 is a section taken on line 2—2 of Fig. 1;

Fig. 3 is a section taken on line 3—3 of Fig. 2;

Fig. 4 is a perspective view showing the arrangement of the heating elements;

Fig. 5 is an end view of one of the heating element supports; and

Fig. 6 is a diagram of the electrical hookup for the heating elements.

There is a certain amount of shrinkage in nylon face or cloth which must be substantially reduced. The higher the setting temperature, the less residual shrinkage in the finished nylon. However, nylon will fuse at about 475 degrees Fahrenheit, and we have found that most laces will singe or turn yellowish at temperatures between 425° F. and 475° F. We have also ascertained that no beneficial results are obtainable at temperatures below 375° F. The necessary working temperature range for setting nylon lace is, therefore, between 375° F. and 425° F. Attempts have been made to set nylon by applying the heat with live steam, boiling, and various other means. Also, attempts have been made to set it chemically. We have found that the most

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effective method of setting is to set up a working zone having a variable temperature range which can be readily controlled and then passing the lace or cloth through this zone at a predetermined rate of speed.

Various designs, types, thicknesses and widths of lace have been found to require different lengths of exposure to different temperatures. These can only be ascertained for the particular goods by test or sample runs on each piece. Also, the length of the working zone will control the speed of movement of the cloth through it. We prefer to set the nylon lace or cloth on a standard tenter frame on which the setting device of the present invention is mounted. Thus, the material is stretched and in motion at a controlled speed on a readily available device which eliminates excess handling. Furthermore, the tenter frame is of sufficient length to permit the heat setting working zone to be of any desired length.

Referring more in detail to the drawings illustrating our invention, Figs. 1 to 3 show the novel setting apparatus straddling a conventional tenter frame of which only the side rails 10 are shown. The lace or cloth 11 is stretched between the rails 10 and is moved along in the usual manner at a predetermined and controlled rate of speed. The novel setting apparatus is so positioned that the lace 11 passes through it. The apparatus is supported on a series of spaced adjustable supports 12, each comprising a cylinder 13 having a shaft 14 slidable therein. The shaft 14 is provided with spaced openings 15 and the cylinder 13 is provided with a pin 16 to permit the shaft 14 to be locked in any adjusted vertical position. The shaft 14 is also provided with an inverted channel member 17 which acts as the actual support for the apparatus.

As can be seen in Fig. 2, the lace 11 is of such width that it will sag in the middle. In order to provide for a uniform distribution of the heat throughout its width, the apparatus must be curved to accommodate the sag of the lace or cloth. The supports 12 are, therefore, so adjusted that the central portion of the apparatus is lower than the side edges to provide the necessary curvature. Resting on the supports 12 is an aluminum sheet 18 which acts as a heat reflector. The inside surface of this sheet may be polished to add to its reflecting qualities. The heat producing elements 19 are mounted on the reflector 18 in an arcuate alignment to conform to the sag of the cloth or lace. The heat producing elements 19 will hereinafter be described more in detail.

A series of spaced bars 20 extend across the

heat elements 19, straddling them, with the ends resting on the reflector 18. These supporting bars 20 are used to support a sheet of glass cloth 21 which acts as a separator between the heat elements 19 and the lace or cloth 11. It has been found that the glass cloth will transmit the heat necessary for setting the nylon, yet will prevent the lace from unexpectedly sagging against the heat elements 19 and being burned thereby.

The outer housing of the above described parts comprises the side supports 22 on which is mounted a series of inverted T-shaped irons 23 which form rectangular portions as shown in Fig. 11. Each rectangular portion supports an aluminum sheet 24 which acts as the upper heat reflector and above which is placed a slab of magnesium or asbestos 25 which acts as an insulator.

As can more readily be seen in Fig. 2, the above described construction forms a covering through which the lace or cloth 11 is passed at a predetermined speed. The heat elements 19 positioned in spaced parallel relationship beneath the lace 11 evenly distribute the heat throughout the width of the lace or cloth 11. The reflectors 18 and 24 serve to concentrate the heat in the housing.

We have found that the most efficient method of producing the desired controlled temperatures is by the use of radiant heat elements.

Referring to Figs. 4 and 5, these elements 19 comprise elongated metallic bars 26 of triangular cross section. The electrical registers, not shown, are positioned inside of the triangular metal bars to produce a radiation flameless glow of the bars. The bars are supported on L-shaped members 27, having annular openings 28, in such manner that one edge of the bar will touch one point on the L-shaped member 27 to reduce the loss of heat by contact to a minimum.

It has been found that there is a limit to the efficient length of these bars. Where the tenter frame is wider than this limit, it is necessary to stagger sets of bars across the width of the frame as shown in Fig. 4. Furthermore, there is a tendency to lose heat along the side edges of the housing beyond the limits of the heating elements 19. This can be prevented by providing additional insulation and reflectors along the side portions 22 or more effectively by placing additional small heat units along the side edges to build up the heat in those areas.

The electrical hookup for the heating elements 19 can be seen in Figs. 4 and 6. It is preferable to start with the direct current generator or exciter 29 having a variable voltage control 30 and a capacity of up to 120 volts D. C. Through a variable alternator 31, the D. C. current is transformed into an A. C. current of 208 volts, 3 phase, 60 cycle, in a delta circuit. As shown in Fig. 6, the delta circuit 32 passes through a safety switch 33 and is used to distribute the current separately to the smaller units and separately to the larger units. The smaller units 34 have a capacity of 5 kw. and would be burned out if they were permitted to take the full load of any of the delta phases. With the hookup shown in Fig. 6, at least two .5 kw.'s are always in series for any phase. For example, following the wiring for phase A, the current passes through one of the small units 34 and in order to balance back on the phase C line or phase B line, it must pass through another small unit 34. The larger units are each 3.5 kw. and can take the full voltage. The larger units, 3.5 kw. are hooked up in a standard delta circuit hookup with each pair of units having one end connected to each other and the phase A connection going to one end of the first four of six units, the phase B connection going to the last four of the six units and the phase C connection coming off the end of the final unit. A temperature indicator 36 is also provided as shown in Fig. 6.

The above described heating elements and electrical hookup permit an even distribution of a controlled variable heat throughout the width of the tenter frame. The number of units that can be placed side by side along the length of the frame is limited only by the length of the tenter frame. In Fig. 1, the applicants show a device in which five hookups similar to Fig. 6, that is fifteen units, are placed in the device.

The use of the heating elements 19 as described hereinabove is for illustrative purposes only, as there are other types of heating elements made by other manufacturers which will produce a controlled flameless heat of the desired type.

It can readily be seen that with the above arrangement of parts, the temperature of the heat setting unit can be readily controlled within fine limits and the speed of the lace or cloth can be controlled in the conventional manner by the tenter frame. The combination of speed and heat desirable for a particular cloth can readily be ascertained by a person skilled in the art with a few sample runs. If the lace or cloth is narrower than the full width, it has been found desirable to use all of the heating elements, as it is difficult to maintain the desired even temperature if some of the heating elements along the edges are shut off. Where the tenter frame is being used for drying cotton fabric or any other fabric which does not require setting, the above appartus can also be employed as a drying unit.

While we have described a single embodiment of our invention and a single process for setting nylon, it is obvious that changes may be made in the size, shape or relative arrangement of parts or in the process without departing from the spirit and scope of the invention as defined in the appended claims.

We claim:

1. An apparatus for setting nylon material, comprising a plurality of adjustable supports, a housing mounted on said supports, means for moving the nylon material through said housing at a predetermined rate of speed, spaced heating elements mounted on the bottom of said housing beneath said moving material to heat said material to a predetermined temperature, the bottom of said housing and said heating elements being arcuately supported by said supports to conform to the sagging contour of said material and means for preventing contact between said material and said heating elements.

2. An apparatus for setting nylon material, comprising a plurality of adjustable supports, a housing mounted on said supports, the bottom of said housing comprising a heat reflector, means for moving the nylon material through said housing at a predetermined rate of speed, spaced heating elements mounted on the bottom of said housing beneath said moving material to heat said material to a predetermined temperature, the bottom of said housing and said heating elements being arcuately supported by said supports to conform to the sagging contour of said material, and means for preventing contact between said material and said heating elements.

3. An apparatus for setting nylon material, comprising a plurality of adjustable supports, a housing mounted on said supports, the top of said

housing comprising a heat reflector, means for moving the nylon material through said housing at a predetermined rate of speed, spaced heating elements mounted on the bottom of said housing beneath said moving material to heat said material to a predetermined temperature, the bottom of said housing and said heating elements being arcuately supported by said supports to conform to the sagging contour of said material, and means for preventing contact between said material and said heating elements.

4. An apparatus for setting nylon material, comprising a plurality of adjustable supports, a housing mounted on said supports, the bottom of said housing comprising a heat reflector, the top of said housing comprising a heat reflector, means for moving the nylon material through said housing at a predetermined rate of speed, spaced heating elements mounted on the bottom of said housing beneath said moving material to heat said material to a predetermined temperature, the bottom of said housing and said heating elements being arcuately supported by said supports to conform to the sagging contour of said material, and means for preventing contact between said material and said heating elements.

5. An apparatus for setting nylon material, comprising a plurality of adjustable supports, a housing mounted on said supports, means for moving the nylon material through said housing at a predetermined rate of speed, spaced heating elements mounted on the bottom of said housing beneath said moving material to heat said material to a predetermined temperature, the bottom of said housing and said heating elements being arcuately supported by said supports to conform to the sagging contour of said material and a sheet of glass cloth for preventing contact between said material and said heating elements.

6. An apparatus for setting nylon material, comprising a plurality of adjustable supports, a housing mounted on said supports, the bottom of said housing comprising a heat reflector, means for moving the nylon material through said housing at a predetermined rate of speed, spaced heating elements mounted on the bottom of said housing beneath said moving material to heat said material to a predetermined temperature, the bottom of said housing and said heating elements being arcuately supported by said supports to conform to the sagging contour of said material, and a sheet of glass cloth for preventing contact between said material and said heating elements.

7. An apparatus for setting nylon material, comprising a plurality of adjustable supports, a housing mounted on said supports, the top of said housing comprising a heat reflector, means for moving the nylon material through said housing at a predetermined rate of speed, spaced heating elements mounted on the bottom of said housing beneath said moving material to heat said material to a predetermined temperature, the bottom of said housing and said heating elements being arcuately supported by said supports to conform to the sagging contour of said material, and a sheet of glass cloth for preventing contact between said material and said heating elements.

8. An apparatus for setting nylon material, comprising a plurality of adjustable supports, a housing mounted on said supports, the bottom of said housing comprising an aluminum heat reflector, the top of said housing comprising an aluminum heat reflector surmounted by heat insulating material, means for moving the nylon material through said housing and between said reflectors at a predetermined rate of speed, spaced electrical heating elements mounted on the bottom of said housing beneath said moving material to heat said material to a predetermined temperature, and a sheet of glass cloth mounted in said housing between said nylon material and said heating elements to prevent contact therebetween, said bottom reflector and heating elements being arcuately supported by said supports to conform to the sagging contour of the nylon material.

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