

Nov. 22, 1949

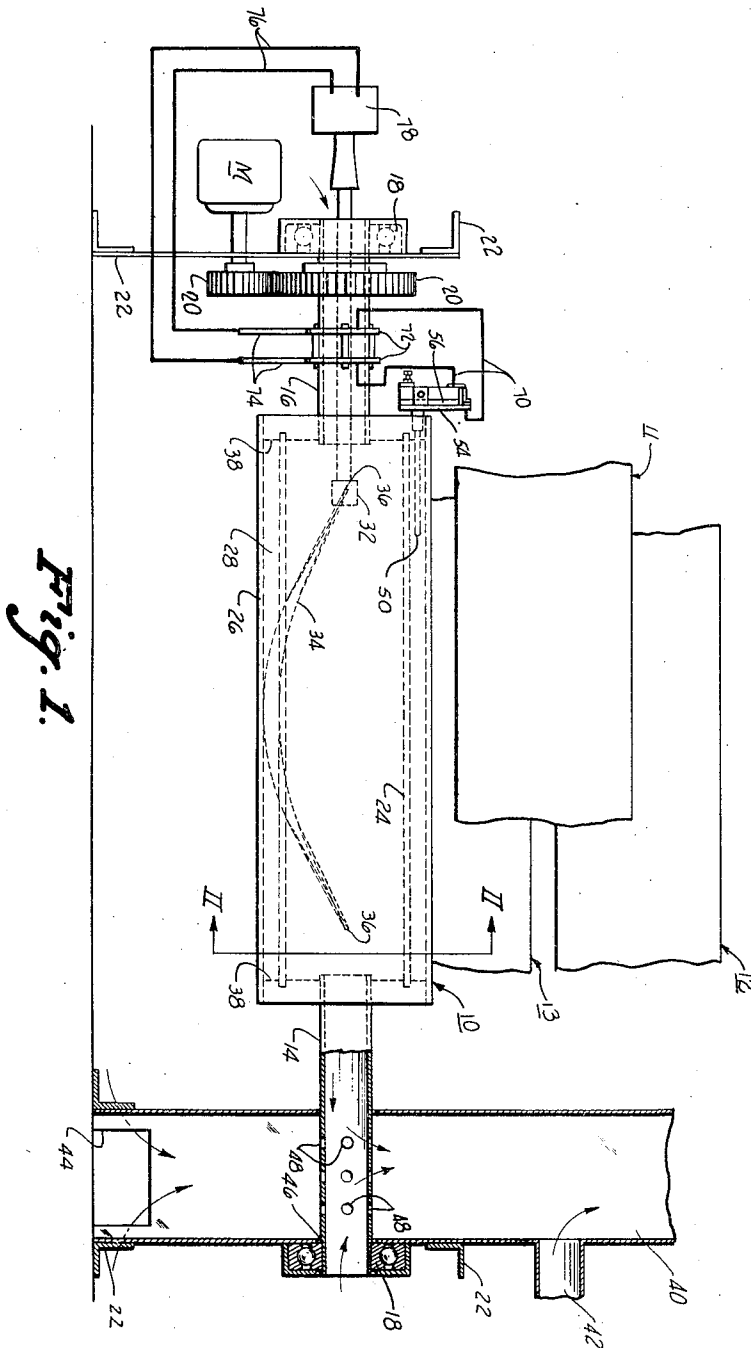
J. E. ROBERTS

2,488,937

SYNTHETIC MATERIAL SETTING APPARATUS

Filed Feb. 10, 1948

3 Sheets-Sheet 1



John E. Roberts
INVENTOR

By Louis Necho
ATTORNEY

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Fig. 4.

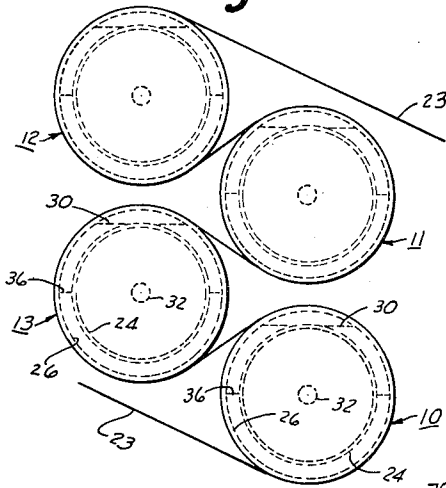


Fig. 2.

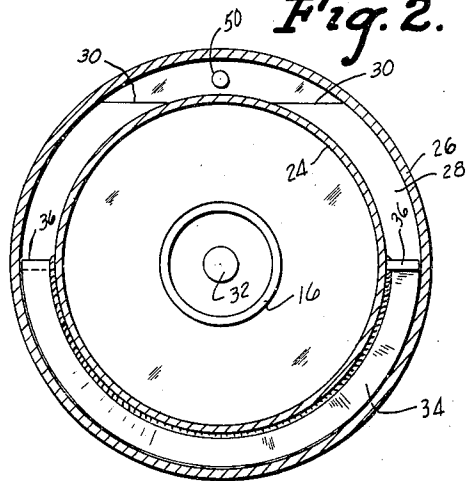
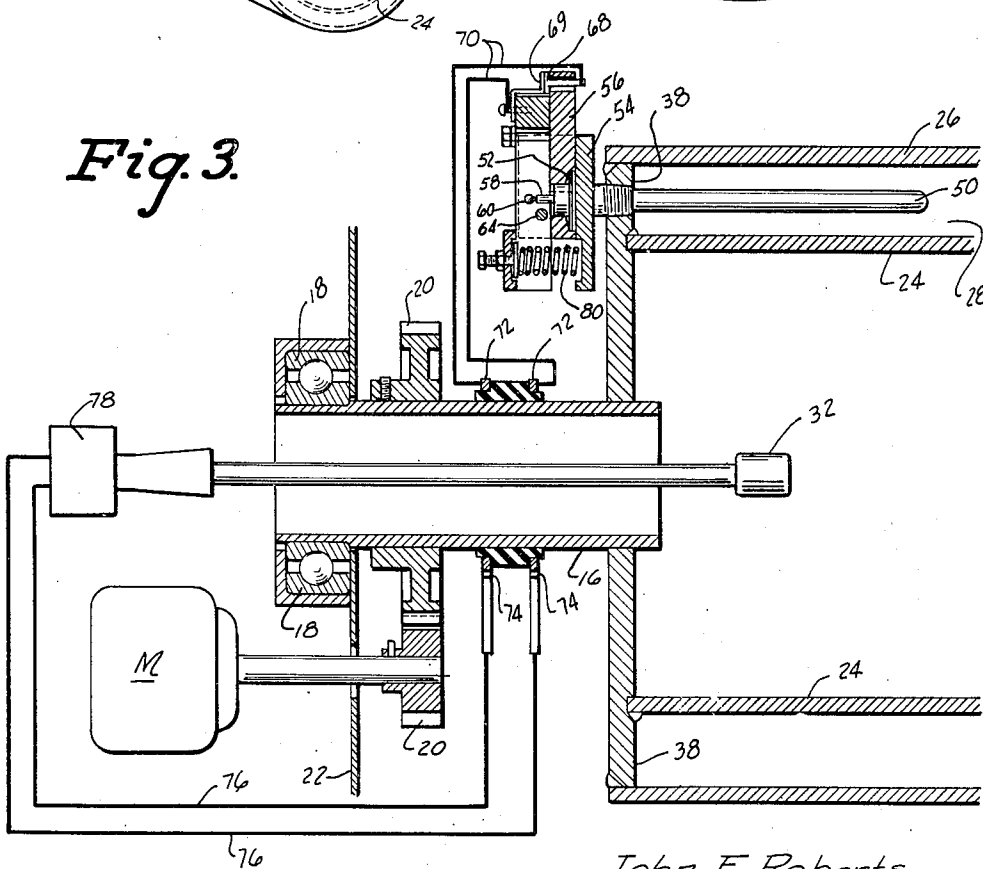


Fig. 3.



John E. Roberts
INVENTOR

By Louis Necho
ATTORNEY

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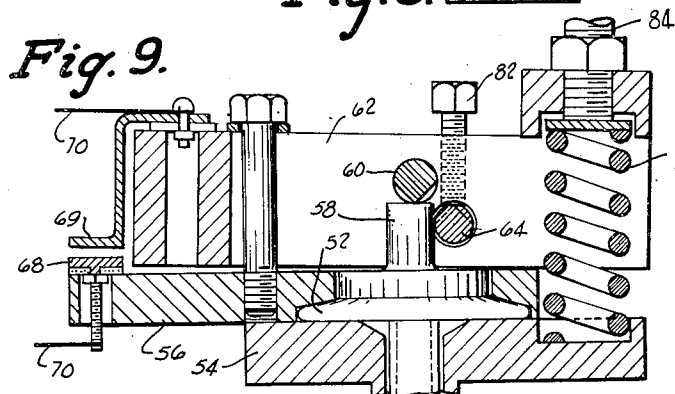
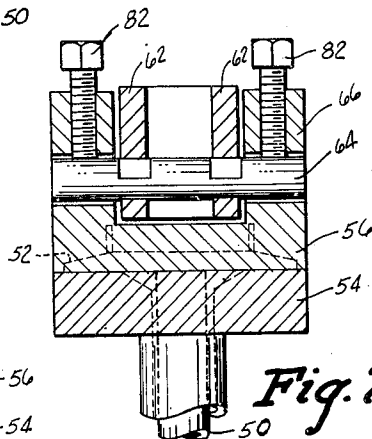
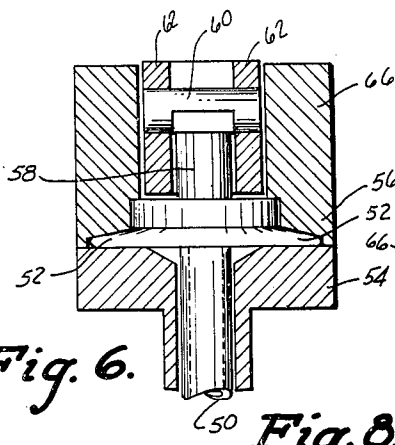
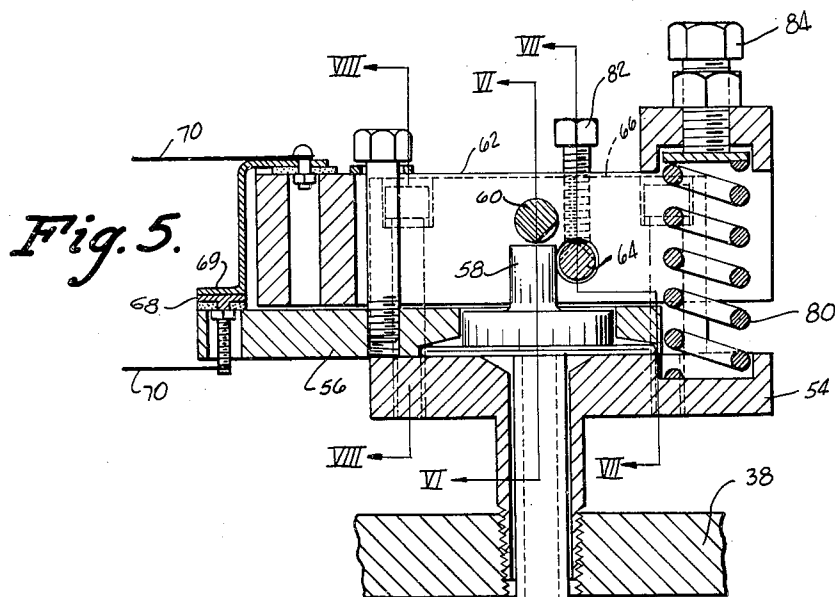
J. E. ROBERTS

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SYNTHETIC MATERIAL SETTING APPARATUS

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3 Sheets-Sheet 3



John E. Roberts
INVENTOR

By Louis Necko
ATTORNEY

UNITED STATES PATENT OFFICE

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SYNTHETIC MATERIAL SETTING
APPARATUSJohn E. Roberts, Philadelphia, Pa., assignor to
Ralph C. Parkes, Glenside, Pa.

Application February 10, 1948, Serial No. 7,455

8 Claims. (Cl. 26—1)

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This invention relates to apparatus of the type used for processing, or "setting" of fabrics formed of synthetic threads such as nylon, rayon and the like.

One object of the invention is to produce improved apparatus of the type set forth.

A synthetic fabric which has not been set tends to crease, to shrink, feels relatively harsh, and its threads tend to shift.

In order to cure these defects, the fabric is set by being subjected to heat of an order only slightly less than the critical heat of the material, or the heat at which the material will be damaged or destroyed. The preferred manner in which the fabric is set is to pass it over one or more heated rolls. Since the temperature to which the material must be subjected is critical, in the sense that, if it is too low, it will not be effective and, if it is too high, it will cause damage, it is very important that the temperature of the surface of the roll be accurately controlled and that it be uniform throughout. Otherwise the setting of the fabric will not be uniform.

It is therefore a still further object of the invention to produce improved, practical, inexpensive and durable apparatus by means of which the temperature of the surface of the heated rolls will be satisfactorily controlled and will be maintained sufficiently uniform throughout.

A still further object is to produce improved means for controlling the temperature of the rolls.

These and other objects are attained by my invention as set forth in the following specification and as illustrated in the accompanying drawings in which:

Fig. 1 is a view, partly in section and partly in side elevation, of a synthetic fabric setting apparatus embodying my invention, certain parts being omitted.

Fig. 2 is an enlarged, fragmentary, section on line II—II on Fig. 1, showing the structure of the heated roll of Fig. 1.

Fig. 3 is a greatly enlarged view, partly in section and partly elevation, showing details of structure of the parts at left hand end of Fig. 1.

Fig. 4 is a diagrammatic, end elevational view, showing the arrangement of the rolls, certain parts being omitted.

Figs. 5 to 9, inclusive, are enlarged fragmentary views showing details of a control mechanism used for controlling the temperature of the rolls.

In Fig. 1 there is shown a synthetic fabric setting apparatus including plurality of hollow rolls

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10, 11, 12 and 13, arranged substantially as shown in Fig. 4.

Each of the rolls is provided with reduced hollow trunnions 14 and 16 which are journaled for rotation on bearings 18. Each roll is rotated by a gear train 20 driven by a motor M. The bearings 18, which support the rolls, are carried by a suitable support or frame 22. The structure thus far described can be readily understood by inspection of Figs. 1 and 3. In Fig. 1 only the roll 10 is shown completely as to structure, support, rotation, and heating but it is to be understood that rolls 11, 12 and 13 of Fig. 4 are identical, in all respects, with the roll 10 of Fig. 1. Also, while in Fig. 4 I show only four rolls with the fabric 23 passing thereover, it is to be understood the apparatus may include a larger or smaller number of rolls.

Each roll is formed of an inner cylindrical shell 24 which coacts with an outer cylindrical shell 26 to form a jacket 28. The jacket 28 is filled to about the level indicated by the line 30, in Fig. 2, with a liquid which can be heated well above the boiling point of water without developing an appreciable pressure so that the rolls may be safely made of relatively light sheet metal construction. Liquids of the kind referred to are available on the market under well known trade names and hence their composition need not be described.

Each roll is provided with a gas or oil burner, or other heating means, 32 located within, but near, one end of the roll for heating the liquid in the jacket 28.

In order to equalize the temperature throughout the surface of the roll, I provide the jacket 28 with a helically extending vane 34. The ends 36 of the vane terminate short of the end walls 38 of the jacket 28, as shown in Figs. 1 and 3, and the vane itself curves through an arc of about 180 degrees, as shown in Figs. 1 and 2. A vane so constructed in the jacket 28 serves to propel the liquid in the jacket, or a major portion thereof, from end to end, as viewed in Fig. 1 with each rotation of the roll. By this means, the liquid in the jacket, will, as the roll rotates, be caused to flow from left to right in the portion of the jacket to one side of the vane, and from right to left in the portion of the jacket to the other side of the vane. This constant circulation of the liquid tends to heat the surface of the roll remote from the burner and tends to cool the surface of the roll near the burner and thus produces a sufficiently uniform temperature over the entire surface of the roll.

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In order to prevent over-heating of the bearings the trunnions 14 and 16 are made hollow and open at their outer ends. Thus the burner, when ignited, will draw considerable air through the hollow trunnion 16 through which the burner passes. The air thus drawn over the bearings, and the fact that the left hand bearings are remote from the burner, keeps these bearings sufficiently cool. To keep the bearings supporting the trunnion 14 cool I provide a stack 40 having upper and lower draft openings 42 and 44, and an intermediate opening 46 through which the trunnion 14 extends. Also, the portion of the trunnion 14 which extends through the stack 40 is provided with openings 48 through which the hot gases of combustion escape upwardly into the stack. The movement of the hot gases upwardly through the stack creates a draft which causes room temperature air to flow into the stack through the openings 42 and 44 and through the open end of the trunnion 14, as shown by the arrows in Fig. 1. The air flowing through these openings keeps the bearings supporting the trunnion 14 sufficiently cool.

An apparatus such as the above described is now in operation and controlled tests have shown that the temperature on the surface of the roll is, for all practical purposes, uniform and that the bearings supporting the rolls remain at substantially room temperature.

In order to control the temperature of the liquid in the jacket and hence the temperature of the surface of the roll, I use the mechanism shown Fig. 3 and in Figs. 5-9. This mechanism includes a pipe 50 which projects into the jacket 28 and which contains an expandable fluid. The pipe 50 is connected to a diaphragm 52 which is confined between plates 54 and 56 and which is adapted, when the liquid in pipe 50 is expanded, to move a pin or plunger 58 to the left as viewed in Figs. 1 and 3, or upwardly, as shown in Fig. 5. The pin 58 is adapted to bear against a pin 60 carried by a rocker arm 62 pivoted at 64 to ears 66 (see Figs. 3 and 5) carried by or forming part of plate 56. The plate 56 carries one terminus 68 of a switch the other terminus 69 of which is carried by the rocker arm 62. Therefore, when the pressure on the diaphragm reaches a predetermined value, the rocker arm is rotated about the pivot 64, in clockwise direction, as viewed in Fig. 5, and moves terminal 68 away from terminal 69. The opposite sides of this switch are connected by wires 70 to slip rings 72 (Fig. 3) which have rotating contact with stationary terminals 74 of an electric circuit 76 which, when the circuit through terminals 68 and 69 is closed, energizes a conventional solenoid, or other mechanism 78 to maintain the flow of fuel to the burner. When the circuit is broken, by separation of terminals 68 and 69, the flow of fuel to the burner is cut off. Since devices of this nature are common and well known no detailed illustration or description thereof are believed to be necessary.

The rocker arm 62 is normally tensioned in counter-clockwise direction in Fig. 5 so as to keep the terminal 69 in contact with terminal 68, a spring 80 and the movement of the rocker arm in response to the action of the diaphragm is regulated by turning bolt 82. The tension of the spring 80 is regulated by turning bolt 84. Again since any number of mechanisms for adjusting devices of this character to predetermine the temperature at which a switch is closed or opened, are available, no more detailed illustrations or description than that above given are deemed

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necessary. The important feature of my invention in this respect is the provision of the pipe 50 within the jacket 28 so that it rotates with the roll and the provision of the rotary rings 72 to establish constant electrical contact with the stationary terminals of the circuit 76 which controls the operation of the burner.

The rolls are arranged in close proximity and in the manner shown in Fig. 4 so that fabric or other sheet material 23 has maximum contact with the surfaces of the rolls.

What I claim is:

1. A synthetic material setting apparatus including a hollow roll adapted to contain a liquid, means for rotatably supporting said roll, means for rotating said roll, means for passing the material to be set over said roll in contact with a substantial portion of the surface of said roll, heating means for heating said liquid, and a vane disposed inside, and extending longitudinally of, said roll the longitudinal axis of said vane forming an angle with the longitudinal axis of said roll whereby the liquid will, when said roll is rotated, flow, longitudinally of the roll, in one direction in the part of the roll to one side of said vane and in the opposite direction in the part of the roll to the other side of the vane.

2. The structure recited in claim 1 in which said vane curves through an arc of approximately 180 degrees and in which the ends of said vane are spaced from the end walls of said roll.

3. The structure recited in claim 1 in which said hollow roll is formed of concentric, spaced inner and outer shells forming a liquid storing jacket therebetween, and in which the liquid heating means is in the nature of a heating element located within one end of the inner shell.

4. The structure recited in claim 1, together with heat responsive means carried by and rotatable with said roll, and means operable by said heat responsive means for controlling the heat input of said heating element.

5. A synthetic material setting apparatus formed of a number of rolls constructed, heated and rotated as set forth in claim 1, with the material to be treated contacting a substantial portion of the surface of each of said rolls.

6. Apparatus of the type described including a support, antifriction bearings carried by said support, a pair of hollow trunnions having their outer ends journaled for rotation in said bearings, a hollow cylindrical roll carried by the inner, juxtaposed ends of said trunnions with the interior of the roll communicating with the interiors of the trunnions, a heating element passing through one of the trunnions and into the adjacent end of said roll, the outer end of this trunnion being open whereby air is drawn there-through to cool the bearing in which the outer end of said trunnion is journaled, and a stack, with the outer end of the other of said trunnions discharging hot gases from the interior of said roll into said stack.

7. The structure recited in claim 6 in which the bearings supporting the last mentioned trunnion are outside said stack and in which the outer end of this trunnion opens to the atmosphere to permit atmospheric air to flow through said end of said trunnion, over said bearings, and into said stack for cooling said bearings, and means for causing atmospheric air to flow upwardly through said stack, past the outer end of said trunnion.

8. For use in a synthetic material setting apparatus, a roll adapted to contain a liquid and to

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be rotatably mounted, said roll being also adapted to receive means for heating said liquid and to have the material to be set passed in contact therewith, and a helical vane disposed inside, and extending longitudinally, of the roll for causing the liquid, when the roll is rotated, to flow, longitudinally of the roll, in one direction in the part of the roll to one side of said vane and in the opposite direction in the part of the roll to the other side of said vane to maintain a substantially uniform temperature over the entire surface of the roll.

JOHN E. ROBERTS.

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