

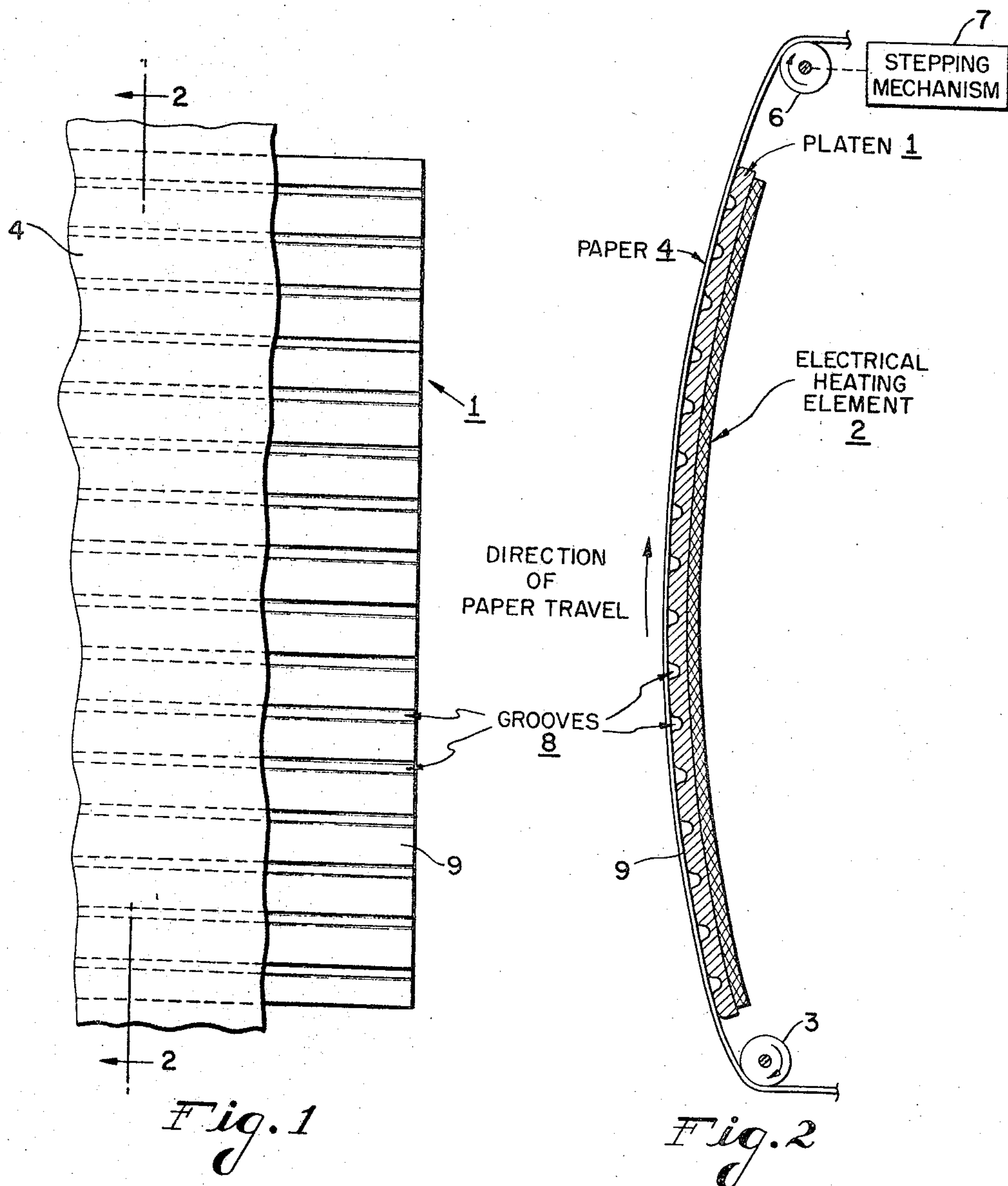
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DEVICE FOR CONTACT HEATING OF MOVING SHEET MATERIAL

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ABSTRACT OF THE DISCLOSURE

A device for contact heating of moving sheet material having an image including lines of printing wherein a heat conducting platen contacting said sheet material is provided with indentations substantially transverse to the movement of the sheet material and means for moving the sheet bearing the image in incremental steps adjusted so that the lines of printing lie in between the indentations after each incremental step.

The present invention relates to xerographic image fixing apparatus and more specifically to image fixing apparatus which utilizes heat to fix a thermoplastic powder image to the surface of a sheet carrying said image.

It is an object of the present invention to provide a new and improved heating device for fixing a thermoplastic powder image upon a sheet being processed by a xerographic reproducing machine.

It is a further object of the present invention to provide a new and improved image fixing heating device for at least quadrupling the speed in which a sheet bearing a xerographic image to be fixed is passed over a direct contact type heating platen.

It is a further object of the present invention to provide a new and improved direct contact type heating platen which reduces the mean pulling force required to cause the image bearing sheet to traverse the platen.

Other objects and advantages of the invention will become apparent as the following description proceeds and the features of novelty which characterize the invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

For a better understanding of the invention, reference may be had to the sole figure which discloses a preferred embodiment of the present invention.

Direct contact type heating platens are well known in the xerographic art for fusing an image of thermoplastic powdered ink to an image bearing sheet, which sheet is passed over the platen thereby to provide visible copy. As the paper is pulled in small incremental steps over the surface of the heating platen, it is alternately tightened and loosened which often results in the creation of an air cushion between the paper and the surface of the heating platen after each step. It is desirable to cause a rapid breakdown of this air cushion so as to increase the rate of heat transfer and, hence, increase the speed in which the paper may be processed by being passed over the surface of the platen. In addition, a vacuum is sometimes formed between the paper and the platen surface which increases the mean force which must be utilized by the pulley to effect paper travel. The crux of my invention is to provide a platen surface having pressure equalizing indentations or ports which communicate with the outside air and which sharply reduce the aforesaid air cushion, so

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as to greatly increase the permissible speed of paper travel across the platen surface. In addition, these indentations reduce the mean pulley force necessary to maintain paper travel since an easy release of the air pressure that holds the paper to the platen is provided for.

The sole figure discloses a preferred embodiment of the invention. Platen 1 is shown in intimate contact with heating element 2 which may be a silicon rubber-covered resistance wire heater, bonded to the concave surface of the platen. A paper feed pulley 3 is disclosed for feeding the paper sheet 4 to the platen. A take-up pulley 6 is also disclosed which is actuated by stepping mechanism 7. In this embodiment of my invention, paper 4 is maintained in intimate contact with platen 1 by virtue of the tension introduced into paper 4 by pulleys 3 and 6. As the paper bearing the powder image traverses platen 1, heat generated by heating element 2 causes the image to be fixed to the paper, as is well known in the art. As mentioned hereinbefore, a thin cushion of air is often created between paper 4 and platen 1 after each step, thereby to reduce heat transfer. This cushion of air is substantially eliminated by the inclusion of traverse grooves 8 which are formed upon the surface of platen 1, as shown. Since grooves 8 communicate with platen edge 9, they are able to function as pressure equalizers. As the paper comes to rest toward the end of each incremental step, air between paper 4 and platen 1 is plowed into grooves 8. The thin cushion of air is thus sharply reduced. Since the grooves 8 could reduce the rate of heat transfer somewhat, it is preferable that stepping mechanism 7 be adjusted so that the lines of printing to be fixed to paper 4 lie in between the grooves when the paper comes to rest after each incremental step.

Pressure equalizing grooves 8 also prevent the build-up of a partial vacuum between paper 4 and platen 1. This partial vacuum causes an increase in the frictional force needed to be overcome by pulley 6, since the net normal force exerted upon paper 4 is increased. In other words, the grooves create an easy release of the air pressure that occasionally holds the paper to the platen and accordingly the mean pulling force is reduced.

The shape of the grooves is relatively unimportant. Good results were obtained by utilizing grooves having a width of $\frac{1}{16}$ of an inch and a depth of $\frac{1}{32}$ of an inch.

It should be understood that other pressure equalizing indentations, other than grooves, may be utilized so long as the indentations communicate with the outside atmosphere, or the equivalent thereof, such as a chamber kept at about atmospheric pressure. For example, the indentations could be staggered lines of "pot holes" which communicate with the outside atmosphere.

While there has been shown and described a specific embodiment of the invention, other modifications will readily occur to those skilled in the art. It is not, therefore, desired that this invention be limited to the specific arrangement shown and described, and it is intended in the appended claims to cover all modifications within the spirit and scope of the invention.

What is claimed is:

1. Apparatus for fixing a thermoplastic powder image including lines of printing to the surface of a sheet bearing said image, said apparatus including a stationary heat conducting platen having a surface and a plurality of lines of indentations in said surface which communicate with the outside atmosphere, means for directly heating said platen, and means for moving said sheet bearing said image in small increments across said surface in con-

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tact therewith at a substantial angle to said indentations thereby to fix said image, said small increments being adjusted so that the lines of printing lie in between the lines of indentations after each incremental step.

2. Apparatus for fixing a thermoplastic powder image including lines of printing to the surface of a sheet bearing said image, said apparatus including a heat conducting platen having a curved surface, an edge, and a plurality of grooves formed upon said surface and extending to said edge, means for directly heating said platen, and means for moving said sheet bearing said image in small increments across said curved surface in contact therewith in a direction substantially perpendicular to said grooves, said small increments being adjusted so that the lines of printing lie in between the grooves after each incremental step.

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