Oct. 6, 1970 R. C. SHERIFF 3,532,854

HEAT WHEEL FOR AUTOMATIC ADDRESSING MACHINES

Filed July 13, 1967 4 Sheets-Sheet 1

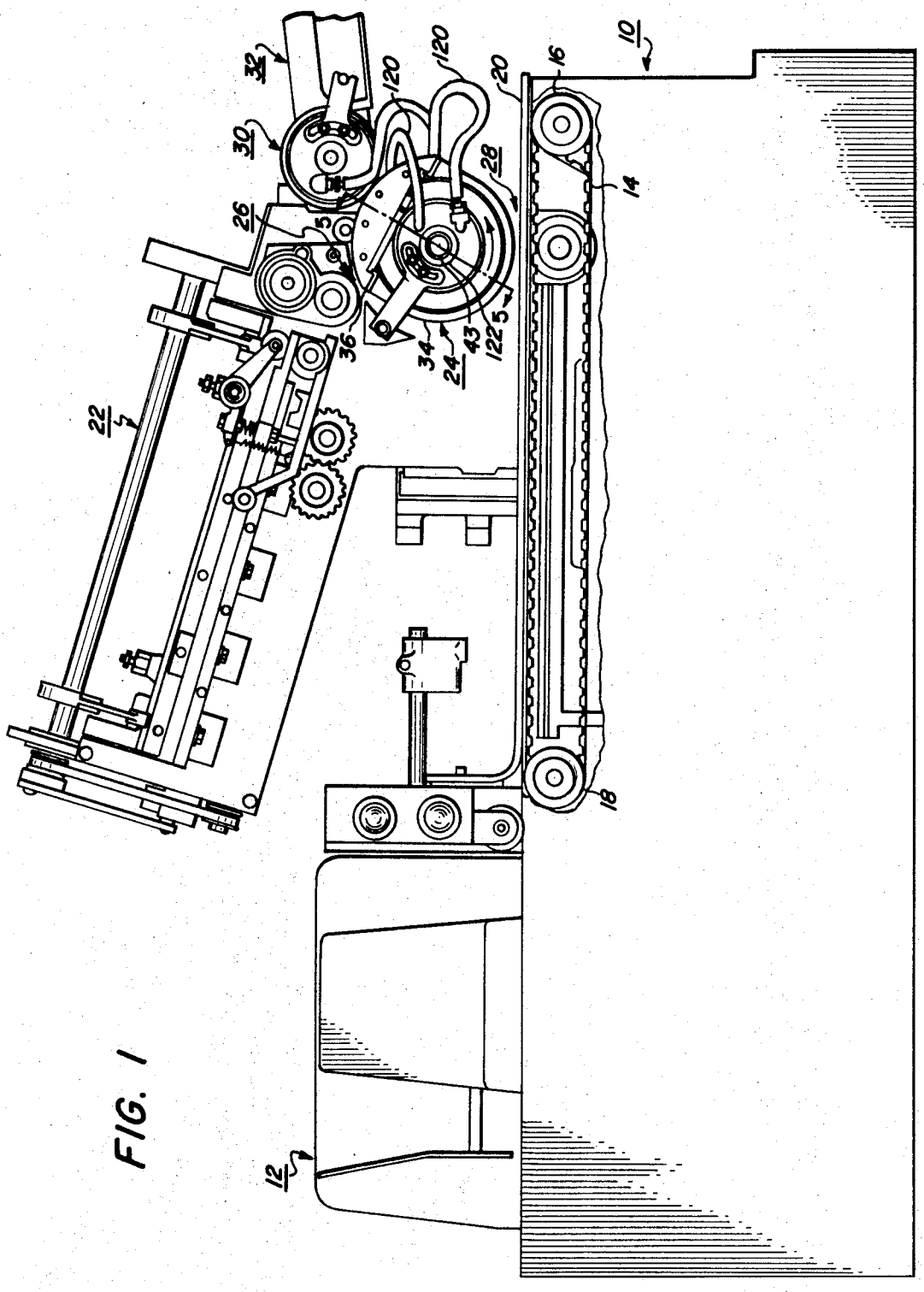


FIG. 1

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HEAT WHEEL FOR AUTOMATIC ADDRESSING MACHINES

Filed July 13, 1967 4 Sheets-Sheet 2

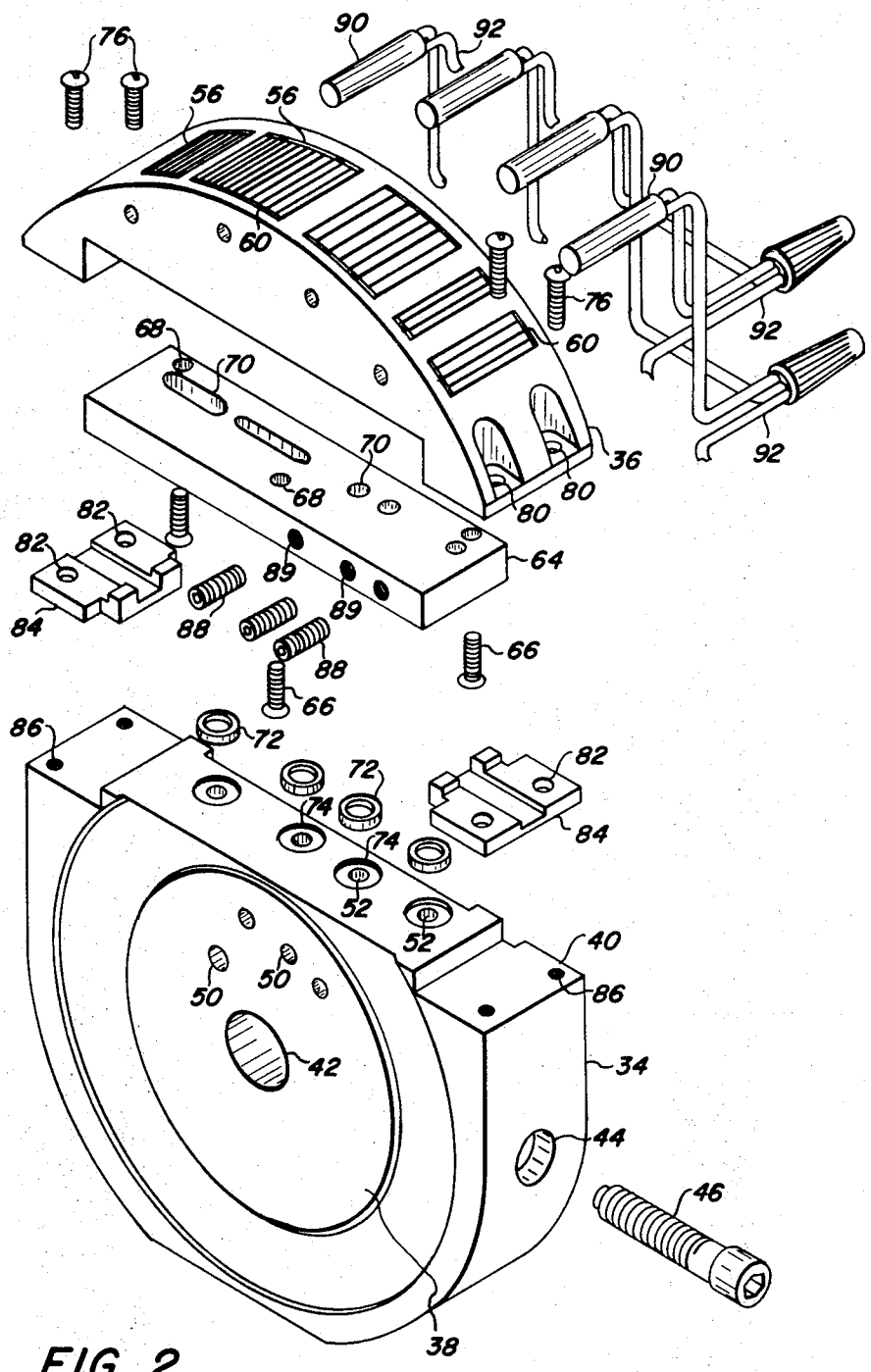


FIG. 2

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HEAT WHEEL FOR AUTOMATIC ADDRESSING MACHINES

Filed July 13, 1967 4 Sheets-Sheet 3

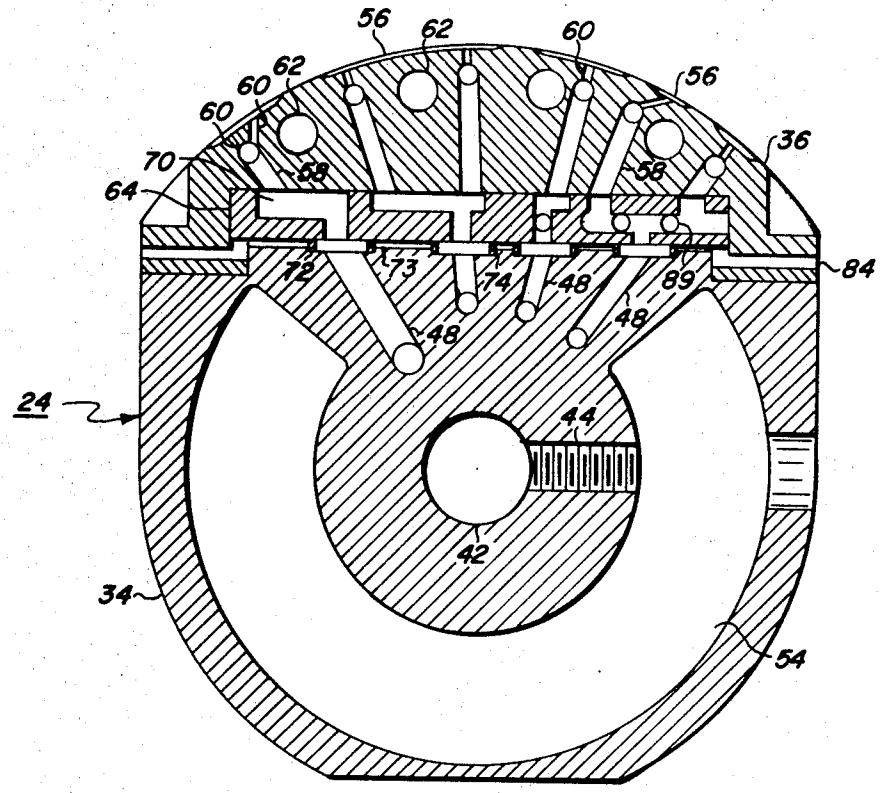


FIG. 3

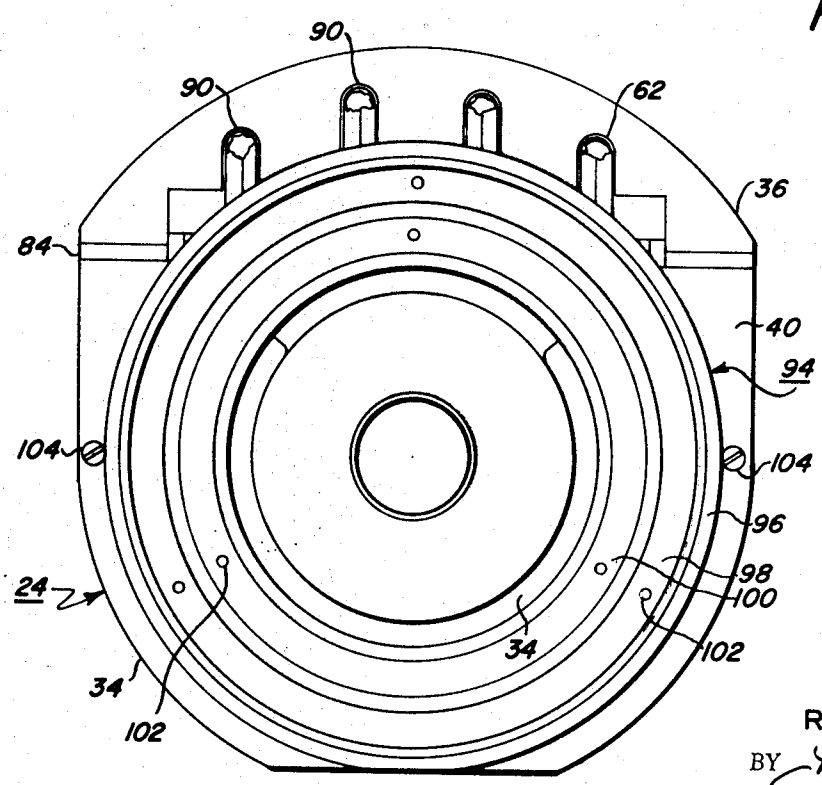


FIG. 4

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HEAT WHEEL FOR AUTOMATIC ADDRESSING MACHINES

Filed July 13, 1967 4 Sheets-Sheet 4

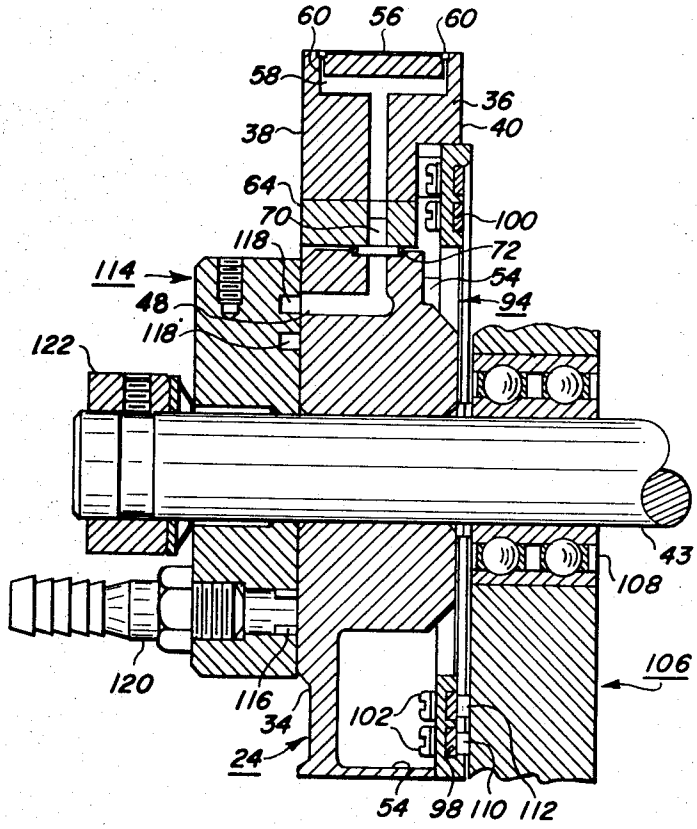


FIG. 5

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3,532,854

HEAT WHEEL FOR AUTOMATIC ADDRESSING MACHINES

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Int. Cl. B30b 15/34; C09j 5/00
U.S. Cl. 219—216 2 Claims

ABSTRACT OF THE DISCLOSURE

A heat transfer wheel with a peripheral portion constituting a vacuum pad for transferring address-bearing labels from a pick-up station to an area where the address is heat transferred to a postal article or the like. The heat transfer wheel includes coupling means for supplying an electrical potential to spaced parallel heating rods embedded in the vacuum pad for maintaining this label-holding surface at a uniform heat level. The vacuum pad is thermally insulated from the rest of the wheel for proper heat retention and distribution. The wheel also has pneumatic leads therethrough so that rotation of the wheel will periodically bring terminal portions of the leads into operative contact with a source of negative pneumatic pressure. This creates a partial vacuum on the surface of the vacuum pad in a programmed fashion for holding and releasing the labels at appropriate times. The wheel is rotatable about an axis transverse to the movement of the postal articles being labeled so that as the wheel rotates, its heated-vacuum portion moves through the label pick-up station and then through the address transfer area in a continuing cycle of operation.

BACKGROUND OF THE INVENTION

This invention relates to an addressing machine and more particularly to an improved heat transfer wheel for conveying and transferring address bearing labels from a pick-up station to an area where the address is heat transferred to a postal article or the like.

In the automatic labeling of postal articles or the like, various methods and machines are known for imparting varying address information to a large number of like articles to be mailed. One such method involves feeding large numbers of unaddressed envelopes, magazines, newspapers or the like beneath a rotating heated transfer wheel. The rotating wheel is oriented to receive and pneumatically hold previously addressed labels coated with a heat activated adhesive on the side of the label remote from the wheel. Further rotation of the wheel brings the adhesive backing of the label into contact with the article to be addressed to effect the transfer of the label from the wheel to the postal article. When the wheel, postal articles, and apparatus for bringing the labels into association with the wheel, are moved in synchronism, the like postal articles can be labeled rapidly, each with different mailing addresses.

In another manner of automatically labeling postal articles, the varying address information may be formed on carbon paper-type labels. In this system, contact between the label and postal article in the presence of heat will transfer the information from the label to the article. The labels, after approximately marking the postal article, must then be removed from the wheel before the next address bearing label is picked up by the portion of the wheel holding the previously transferred information.

Apparatus for carrying out these techniques is disclosed in copending U.S. patent application Ser. No. 505,930 filed Nov. 1, 1965 in the names of Harry V. Kirk and James E. Doane.

While such apparatus has been found satisfactory, the requirement that such operations be carried out at higher speeds and with a higher degree of dependability has necessitated certain modifications. For example, prior art devices do not provide for the even distribution of heat in the vacuum pad area. The vacuum pad area is that portion of the periphery of the wheel which holds and transports the label. This is a very critical requirement since uneven heating of the vacuum pad and label could cause the incomplete transfer of the address information from this label to the postal article being marked. Furthermore, proper insulation of the vacuum pad is also necessary for proper labeling since adequate heating elements, used in an improperly insulated vacuum pad, could cause conduction of the generated thermal energy to areas of the wheel remote from the surface contacting the label. This can result in the uneven heating of the label and consequently an incomplete or uneven addressing of the postal articles.

SUMMARY OF THE INVENTION

It is, therefore, an object of the instant invention to automatically address large numbers of postal articles or the like, rapidly and completely.

It is a further object of the invention to uniformly heat peripheral surfaces of vacuum pads in automatic addressing machines.

It is a further object of the invention to heat the periphery of a vacuum pad with parallel heating rods embedded in the vacuum pad, equally spaced from each other and evenly spaced from the surface of the pad so that the generated thermal energy evenly heats labels pneumatically held thereon.

It is a further object of the invention to thermally insulate a heated vacuum pad from a label transfer wheel for maintaining even and constant heat on the external surface of the vacuum pad.

These and other objects of the instant invention are achieved by a label transfer wheel with a peripheral portion which constitutes a vacuum pad. The vacuum pad is provided with heating rods arranged parallel to the axis of rotation of the wheel and in a concentric orientation with the axis of rotation of the wheel as well as with the periphery of the vacuum pad. The heating rods are equally spaced from each other to ensure an even heating of the surface of the vacuum pad as well as labels which are pneumatically held thereon. The vacuum pad is thermally insulated from the rest of the heat transfer wheel. This eliminates the conduction of thermal energy from the vacuum pad to thereby further ensure the even and constant conduction of heat to the surface of the vacuum pad. The arrangement of the heating elements in combination with the insulating barriers results in the even heating of the surface of the vacuum pad and labels held thereon for proper transferring of address information to postal articles or the like.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the invention as well as other objects and further features thereof, reference is had to the following detailed description of the invention to be read in conjunction with the accompanying drawings wherein:

FIG. 1 is a side elevational view of an automatic addressing machine with portions thereof broken away to show internal mechanisms;

FIG. 2 is an exploded view of the improved sheet transfer wheel which constitutes the basis of the instant invention;

FIG. 3 is a vertical sectional view of the heat transfer wheel of FIGS. 1 and 2;

FIG. 4 is an enlarged elevational view of the heat transfer wheel of FIG. 1 shown from the reverse side; and

FIG. 5 is a horizontal sectional view of the heat transfer wheel taken along lines 5—5 of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Shown in FIG. 1 is an automamtic addressing machine of the type capable of receiving the improved heat wheel of the instant invention. The overall machine is encased by a general housing **10**, parts of which have been removed in FIG. 1 to show internal constructions. The overall machine is shown schematically in FIG. 1 and includes, on the left thereof, a magazine **12** for the reception of stacked articles to be labeled. The walls of the magazine are adjustable for receiving stacks of materials of varying sizes. Suitable conveying mechanisms may be employed to move the lowermost article within the magazine into association with the timing belt **14** which conveys such article past the labeling instrumentalities in a programmed fashion. The timing belt is supported on rollers **16** and **18**, at least one of which is driven by a suitable source of power not shown. It is this array of elements which permits the seriatim feeding of postal articles across the table **20** of the machine.

Labels to be used for addressing are stored in a label preparation station **22**. This station acts to cut, trim and feed the labels sequentially to the moving postal articles via the heat transfer wheel **24**. The individual labels are pneumatically picked up by the heat transfer wheel at a label pick-up station **26** and individually moved to an address transfer station **28**, which is approximately 180° away. It is during the 180° of contact with the heated vacuum pad **36** that the heat of the vacuum pad **36** partially melts, softens or tackifies either the carbonized information on the label or the heat activated adhesive. When the machine is operated to transfer only the information from the label to the postal article, the lable itself is pneumatically retained on the heat transfer wheel until it is moved in the direction of the arrow as shown in FIG. 1 into contact with a vacuum pick-off wheel **30**. At this point the used label is pneumatically transferred to the vacuum pick-off wheel for deposition in trough **32**. When the machine is operated in a fashion whereby the entire label is transferred to the postal article, the vacuum pick-off wheel **30** and trough **32** may be eliminated.

In an alternate mode of operation, wherein the vacuum pick-off wheel **30** and trough **32** are not required, the label preparation station may be positioned in the area where the vacuum pick-off wheel and trough are shown in FIG. 1.

In a further modification of the alternate mode of operation, those labels which have heat transferred their information to the postal articles may be collected in the trough. Then the collected labels may be adhesively or heat transferred to another set of postal articles when provision is made for retaining sufficient address information on the once-used labels.

As will be understood, the various elements of the machine including, the postal article feeding means and timing belt **14**, the label preparation station **22** with its label feeding means, and the heat transfer wheel **24** and vacuum pick-off wheel **30**, when needed, enable the machine to rapidly label large numbers of like postal articles. A more complete description of these mechanisms, as well as their interrelationship with each other can be had by reference to the aforementioned copending patent application. The instant invention is primarily concerned with an improved heat transfer wheel **24** capable of affording to the machine a more efficient operation.

Details of the heat transfer wheel can readily be seen by reference to FIGS. 2–5. The heat transfer wheel, indicated generally by numeral **24** includes two major sections, the block **34** and the vacuum pad **36**. The block **34** has had a first face **38** adapted for operation in conjunction with the vacuum creating means and an opposed or second face **40** for electrically coupling the rotating wheel to a source of electrical potential. The block has an aperture **42** for positioning the wheel on a rotatable shaft **43**. Threaded bore **44** receives a set screw **46** for fixing the block for rotation with the shaft.

Also formed in the block are pneumatic passages **48** having first openings **50** for periodic communication with a source of negative potential on the body of the machine. The opposite end **52** of the passages **48** are adjacent that section of the periphery of the block adapted for communication with the vacuum pad **36**. The opposed or second face **40** of the block is formed with an arcuate recess **54** for retaining the electrical wiring for energizing the heating element within the vacuum pad. This recess **54** can be more readily seen in FIG. 3.

The vacuum pad **36** is constructed of a thermally conductive rigid material and is provided with lands and grooves or shoe area **56** over that portion of its periphery adapted to transport labels. Primary pneumatic passages **58** branch off into secondary pneumatic passages **60** adjacent the grooves formed in the periphery so that when coupled to a source of negative pneumatic pressure with a label thereover, the partlal vacuum exists over a major portion of the held label. Apertures **62**, parallel to the axis of rotation of the heat transfer wheel **24**, are also provided for the reception of heating rods.

Positioned intermediate the block **34** and vacuum pad **36** is a manifold plate **64** and various insulating elements. The manifold plate **64** is rigidly secured to the vacuum pad **36** by set screws **66** which extend through apertures **68** into mating apertures in the vacuum pad. A network of pneumatic passages **70** through the manifold plate **64** creates a unitary vacuum system between the manifold plate **64**, and vacuum pad **36** leading to the land and groove portion on the periphery of the vacuum pad. Insulating rubber washers **72** pneumatically connect the pneumatic passage **48** of the block **34** with the pneumatic passages **70** of the manifold plate **64** for creating a complete vacuum creating system from ports **50** on the first face **38** of block **34** to the land and groove section **56** of the vacuum pad **36**. These insulating rubber washers **72** are held in recesses **74** of the block **34** to restrict their lateral movement. The use of the compressible insulating washers **72**, with lengths greater than the depth of recesses **74** retains the pneumatic connections.

The vacuum pad **36** is rigidly secured to the block **34** to form an integral heat transfer wheel **24** by set screws **76**. Four such set screws are positioned through apertures **80** in the vacuum pad apertures **82** in insulating barriers **84** and into apertures **86** of the block. The insulating barriers **84** hold the vacuum pad **36** and its attached manifold plate **64** fixedly secured, but thermally insulated from the block **34**. As best seen in FIG. 3, barriers **84** and washers **72** hold vacuum pad **36** separated from block **34** to form an air space **73** therebetween over a major portion of the mutually facing areas between block **34** and pad **36**. As can be understood, the use of insulating materials for barriers **84**, washers **72**, and screws **76**, thermally insulates the heated vacuum pad from block **34** for minimizing the loss of heat generated from internal of the vacuum pad. Commercially available fiberboard has been found acceptable for use as the insulating barrier members **84**.

Valves **88** in the form of set screws are adjustably positioned in threaded apertures **89**. Any number of such valves may be employed in the manifold plate **64** to selectively interfere with the flow of air from the block **34** to the vacuum pad **36**. In this manner, the vacuum area of the land and groove section of the vacuum pad may be increased or decreased as desired. The vacuum in one area thereof may also be shut off entirely if it is desired to operate the machine with labels shorter than the length of the vacuum creating surface.

Heat is supplied to the vacuum pad **36** by circular heating rods **90** which fit in the apertures **62** of the vacuum pad. As shown in FIG. 3, the heating rods **90** are arranged in an arcuate fashion near the surface of the vacuum pad **36**. Rods **90** are substantially equally spaced from each other, the centers of the rods being arranged to be concentric with the axis of rotation of the block **34** and surface of the vacuum pad. The rods are so spaced that the generated thermal energy from each of the rods radiates outwardly towards the surface to be heated in a manner such that it is overlapped and supplemented by the thermal energy of the next adjacent heating rod. In this manner, a smooth and even heating of the entire surface of the vacuum pad is achieved. As explained hereinabove, it is this smooth and continuous heat on the surface of the vacuum pad which uniformly heats the transported label for allowing the complete and even transfer of the address to the postal articles. This feature is extremely critical for proper functioning of automatic addressing machines, especially at high speeds.

Electrical potential is supplied to the heating rods **90** through electrical leads **92**. The leads **92** are held within the recess **54** of the block **34**. The recess **54** with electrical leads **92** therein is covered by a plate **94**. The plate **94** is constructed of an annularly shaped sheet **96** of a thermally and electrically insulating material such as fiberboard. Electrically conductive rings **90** and **100** are positioned in recess of the sheet **96** by a plurality of screws **102**. The entire plate **94** is held in position on the block **34** by screws **104**. In addition to holding the rings **98** and **100** to the sheet **96**, the screws **102** act as an electrical connection between the rings and the ends of the electrical leads **92** remote from the heating rods **90**.

The heat transfer wheel **24** is positioned for rotation with shaft **43** during normal operation. The face **40** of the wheel which is mounted on the inboard side of shaft **43** is adapted for operative coupling with an electrical portion of the automatic addressing machine. Note FIG. 5. Machine portion **106** which is the support for the electrical coupling means is mounted to the shaft **43** through a ball bearing assembly **108** to remain stationary during rotation of the shaft and heat transfer wheel. This stationary portion of the machine supports a pair of electrical coupling brushes **110** and **112** which bear against the rotating rings **98** and **100** to supply the heating rods **90** with electrical potential during normal operation of the machine.

Also positioned on rotating shaft **43**, outboard of the heat transfer wheel **24** is a machine portion **114** also mounted against rotation with respect to the shaft and heat transfer wheel. Machine portion **114** is provided with various arcuate pneumatic grooves **118** and valve openings **116**. These grooves are connected by passages to hose-type couplings **120** for interconnecting the grooves to a source of negative potential. It is the network of arcuate pneumatic grooves **118** and valve openings **116**, connected to an exterior source of negative pneumatic pressure, which permits ports **50** on the face of the block **34** to create the vacuum on the surface of the vacuum pad in a programmed fashion during the rotation of the heat transfer wheel. The various elements supported on shaft **43** are prohibited from axial movement by means of removable cap **122**.

The machine portions **106** and **114**, as well as shaft **43** and cap **122**, operate in the same manner as disclosed in the aforementioned copending application. The invention herein is concerned with an improved heat wheel **24** for use as a retrofit element in the machine of the aforementioned copending application. It can thus be understood that machine portion **114** is rotatably adjustable for varying the programming of the vacuum creating elements. It should be further understood that while the heat transfer wheel has been disclosed with a single vacuum pad, the provision of plural heating pads around the circumference of the block is also possible by the incorporation of proper pneumatic passages and additional heating rods and insulating barrier members. The above-described heating wheel has been illustrated as being of the type to convey and transfer address-type information to postal articles or the like. It should, however, be understood that the principles upon which the instant invention is founded could readily be applied to transferring any information such as indicia, images or like material to a backing sheet or sheets moved through a transfer station wherein the peripheral speed of the heat transfer wheel is the same as the linear speed of the member receiving the transferred matter.

While the instant invention has been described as carried out in a specific embodiment thereof, it is not desired to be limited thereby, but it is intended to cover the invention broadly within the scope of the appended claims.

What is claimed is:

1. A heat transfer wheel for transporting image bearing labels into contact with an article and then transferring the image to the article including,

a block apertured for mounting on a rotatable shaft,

a vacuum pad secured to said block with a peripheral label-supporting surface concentric with the axis of rotation of said block,

pneumatic passages through said vacuum pad and said block for providing a label-holding suction on said surface during the transportation of labels,

a plurality of heating rods mounted in said vacuum pad, substantially equally spaced from each other to evenly heat said surface, said heating rods being spaced from each other a distance capable of allowing the emitted thermal energy of each rod to overlap and supplement the emitted thermal energy of the next adjacent rod throughout the vacuum pad region adjacent said surface,

and insulating means to thermally separate said vacuum pad from said block, said insulating means including insulating barrier members contacting said block and said vacuum pad over a minor portion of their mutually facing areas and defining an air space over a major portion of their mutually facing areas.

2. A heat transfer wheel as set forth in claim **1** wherein the insulating means further includes insulating hollow washers intermediate said block and said vacuum pad to constitute pneumatic passages interconnecting said block and said vacuum pad.

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U.S. Cl. X.R.

219—244; 156—499