Jan. 7, 1964 W. L. PELTIER 3,117,209

BRUSHLESS WIRE PREHEATER

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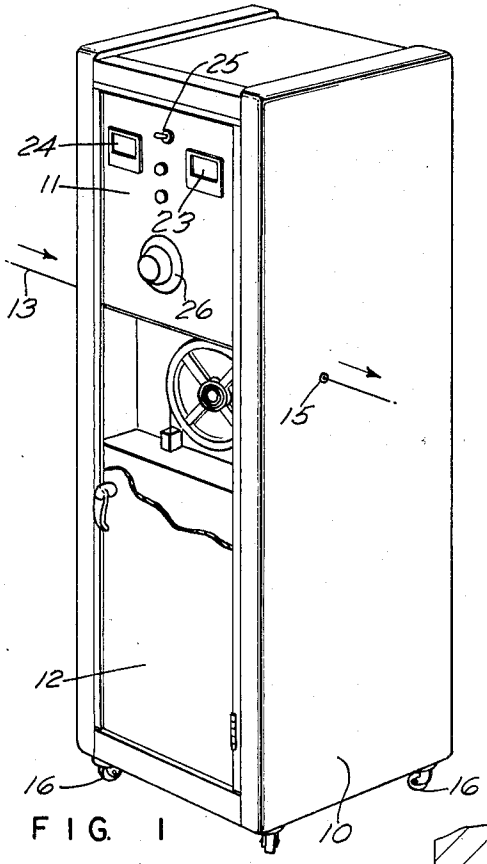


FIG. 1

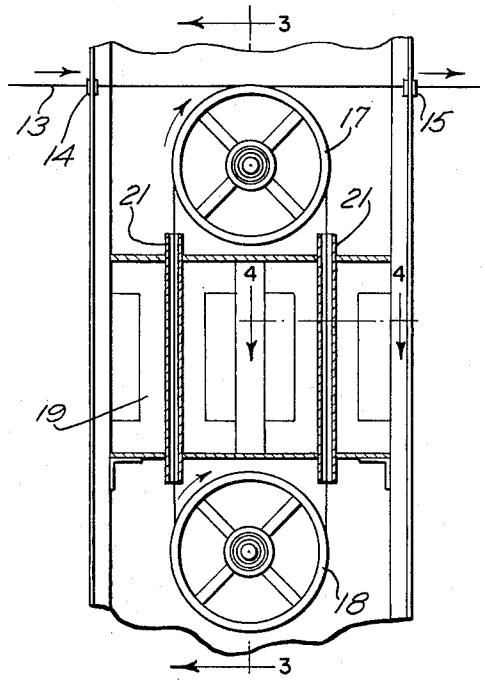


FIG. 2

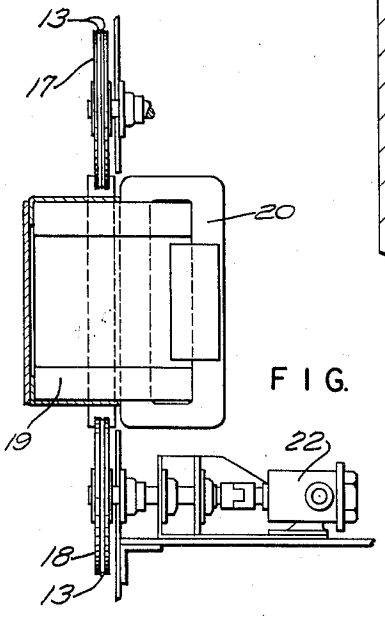


FIG. 3

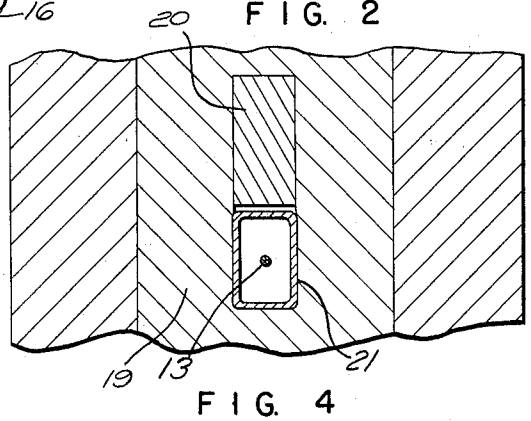


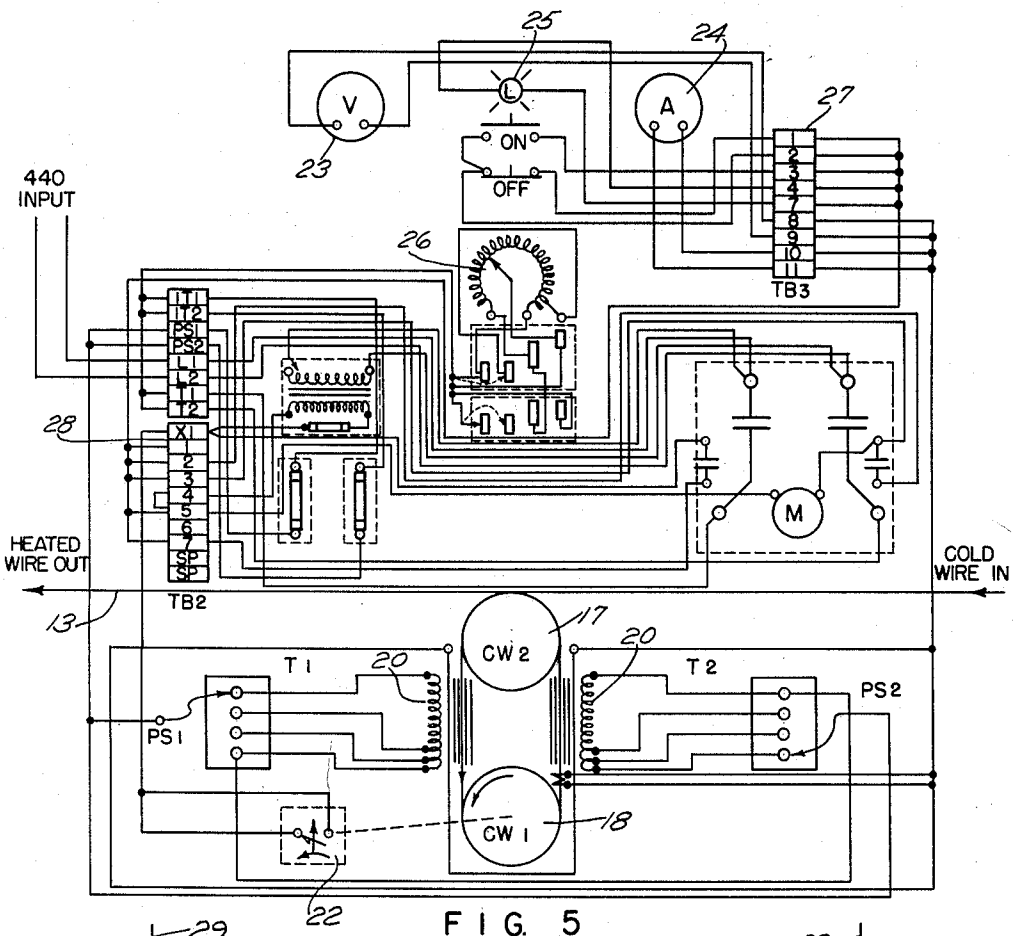
FIG. 4

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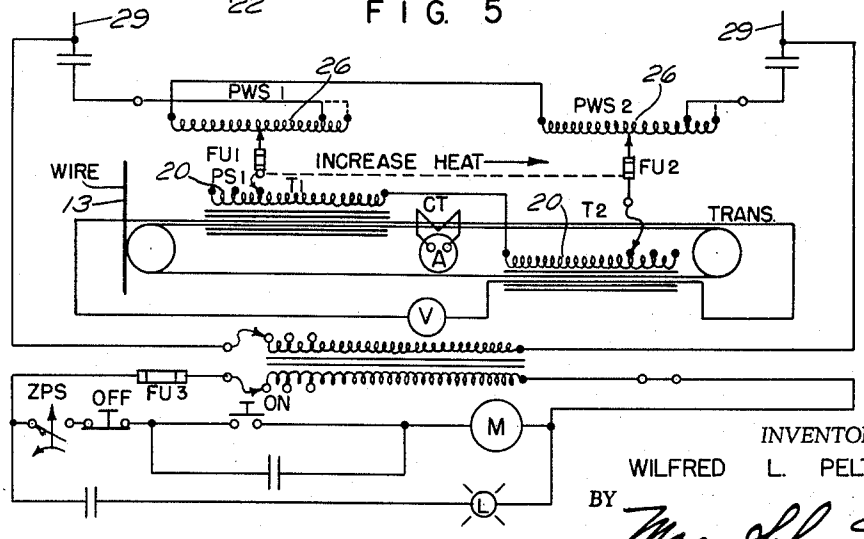
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F I G. 5



F I G. 6

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United States Patent Office 3,117,209 Patented Jan. 7, 1964

3,117,209

BRUSHLESS WIRE PREHEATER

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Filed Feb. 8, 1962, Ser. No. 171,976
3 Claims. (Cl. 219—10.61)

My present invention relates to the electrical art and more particularly to a preheating device for electrical wire and cable fed into an extruding die.

The principal object of the present invention is to provide a device for heating a bare conductor wire while in motion.

Another object of the present invention is to provide a wire heating device which eliminates the use of electrical brushes and similar contact elements.

Another object of the present invention is to provide a heating device having a positive heat control at any speed of movement of the wire.

A further object of the present invention is to provide a heating device which is simple in construction and easy and economical to manufacture and operate.

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

In the drawings,

FIG. 1 is a perspective view, partly broken away of a device embodying my invention.

FIG. 2 is a vertical section through the inductor.

FIG. 3 is a section taken on line 3—3 on FIG. 2.

FIG. 4 is an enlarged section taken on line 4—4 on FIG. 2.

FIG. 5 is a rear view of the device showing the control panel and general hookup of parts.

FIG. 6 is a wiring diagram of the layout shown in FIG. 5.

Electrical conductor wire is normally coated with plastic or rubber insulation. The wire is fed from a reel through an extruding die at speeds ranging from 200 feet to 2000 feet per minute. It has been found advisable to preheat the wire before entering the die. In Patent No. 2,931,891 issued April 5, 1960 to Waldman and Santos and entitled Wire Preheating Device, there is illustrated a means for electrically heating the wire and controlling the heating current. However, in actual experience it has been found that the transfer of the current to a moving wheel requires the use of heavy brushes which generate a good deal of heat and which wear considerably. The present invention is designed to eliminate the brushes thus greatly simplifying the construction and greatly reducing wear.

Referring more in detail to the drawings illustrating my invention, the device is housed in a rectangular housing 10 in which the upper front portions forms the operating panel 11 and the lower front portion forms a door 12 which covers the heating of the wire and provides a safety factor. As illustrated in FIGS. 1 and 2, the wire 13 enters the housing 10 from the left to a small opening 14 and leaves it at the right through another small opening 15. The housing 10 may be supported on casters 16 with a vertical adjustment. This is necessary since it is desirable to pass the wire directly into the extrusion die when it leaves the housing 10.

In the form illustrated herein I provide a pair of vertically spaced wheels, an upper wheel 17 and a lower wheel 18. Both wheels are preferably made of bronze and are mounted in bearings permitting easy turning movement.

The upper wheel 17 has two peripheral grooves and the lower wheel 18 has a single groove. The wheels are rotated by the wire. Viewing FIG. 2, as the wire 13 enters from the left it enters one of the grooves of the upper wheel 17 passes around the wheel and downwardly to the lower wheel 18 around the wheel 18 and upwardly into the second groove of the wheel 17 and then out to the right. This forms a closed loop of wire passing over both wheels. The tensions and movement of the wire rotates both wheels clockwise as shown by the arrows in FIG. 2.

In accordance with the present invention the wire is heated by an inductor having primary windings. The wire is passed through the inductor which induces a current into the wire. The wire travels in the form of a closed loop which, in effect, short circuits the induced current causing the wire loop to heat up. The wire is kept in motion so that it will not overheat. Thus the heat of the wire is controlled by its speed and the induced current.

Now referring to FIGS. 2, 3 and 4, I provide an iron core 19 on which is wound the primary windings 20 of the inductor. Space is provided vertically for the passage of the wire 13. This space is provided with a rectangular liner 21 which may be of fiberglass or other insulating material and which preferably extends above and below the inductor windings 20 as shown in FIG. 2. The liner 21 protects the inductor windings 20 from the heated moving wire 13. Since the wheels 17 and 18 are made of a conductive material such as bronze, it is not necessary for the wire to be actually looped but the loop is formed through the wheel.

For purposes of safety, means must be provided to shut off the current if the wire is stopped. Otherwise the wire will overheat until it melts. I therefore provide an inertia switch 22 mounted in the housing behind the lower wheel 18 as shown in FIG. 3 and coupled to the shaft on which the wheel 18 is mounted. The switch 22 shuts off the current to the inductor whenever the wheel 18 is rotated at less than a predetermined safe speed.

FIGS. 5 and 6 illustrate the general layout and the circuit for the device shown in FIGS. 1 to 4 inclusive including its controls. The device is provided with a voltmeter 23, an ammeter 24 and a signal light 25 to indicate when the current is on. The current is controlled by a variable auto transformer 26. The various wire connections are made from a front panel terminal block 27 and a power circuit terminal block 28.

Referring to FIG. 6, the input line comprises the terminals 29 connected to the variable auto transformer 26 which regulates the current to the windings 20 of the inductor. The wiring diagram shown in FIG. 6 shows the general movement of the current through the complex layout shown in FIG. 5.

The device of the present invention thus provides for an accurate control of a heating current passing through a continuously moving wire. Since the current in the wire is induced, brushes have been eliminated and the ambient heat in the housing 10 has been reduced. The wire merely forms a closed loop secondary to a controlled primary inductor. The current is confined to the loop and therefore there is no hazard in touching the wire or housing. The present invention therefore eliminates a great deal of the undesirable features present in similar wire heaters. The construction is greatly simplified thus eliminating a great deal of maintenance. Furthermore, the cost has also been greatly reduced. The device is more efficient because the current can be controlled more accurately. Other advantages of the present invention will be readily apparent to a person skilled in the art.

I claim:

1. A heating device for heating an electrical conductor wire in linear motion, comprising a rectangular housing,

a pair of spaced, vertically aligned, grooved wheels rotatably mounted in said housing, said wheels being formed of electrically conductive material, said wire entering horizontally through one side wall of said housing, passing over the upper wheel, down and around the lower wheel, up and over the upper wheel again to form a closed loop, and out horizontally through the opposite side wall of said housing, whereby movement of said wire through said housing causes rotation of said wheels, means for inducing an electric current in the portion of the wire forming the loop between said wheels to heat the wire, said current inducing means including an inductor having primary windings, said windings surrounding vertical passageways positioned in spaced parallel relation between said wheels, a dielectric liner in each of said passageways, said wire loop extending between said wheels through said passageways, a rotatable shaft in said housing, said lower wheel being mounted on said rotatable shaft, and an inertial device mounted on said rotatable shaft, said inertial device being interposed between said inductor and its source of current supply, whereby said device will interrupt the current to said inductor at a predetermined minimum rotation of said shaft.

2. A heating device for heating an electrical conductor wire in linear motion, comprising a rectangular housing, a pair of spaced, vertically aligned, grooved wheels rotatably mounted in said housing, the upper of said wheels having a pair of grooves and the lower of said wheels having a single groove, said wheels being formed of electrically conductive material, said wire entering horizontally through one side wall of said housing, passing over one groove of the upper wheel, down and around the lower wheel, up and over the other groove of the upper wheel to form a closed loop, and out horizontally through the opposite side wall of said housing, whereby movement of said wire through said housing causes rotation of said wheels, means for inducing an adjustable, predetermined electric current in the portion of the wire forming the loop between said wheels to heat the wire, said current being confined to said loop to keep said housing and horizontal portion of said wire free of any electrical potential, said current inducing means including an inductor having primary windings, said windings surrounding vertical passageways positioned in spaced parallel relation between said wheels,

a dielectric liner in each of said passageways, said wire loop extending between said wheels through said passageways, means for applying an adjustable, predetermined electric current to said inductor, a rotatable shaft in said housing, said lower wheel being mounted on said shaft, and means associated with said shaft for interruping the current between said inductor and said current applying means at a predetermined minimum rotation of said shaft.

3. A heating device for heating an electrical conductor wire in linear motion, comprising a rectangular housing, a pair of spaced, vertically aligned, grooved wheels rotatably mounted in said housing, the upper of said wheels having a pair of grooves and the lower of said wheels having a single groove, said wheels being formed of electrically conductive material, said wire entering horizontally through one side wall of said housing, passing over one groove of the upper wheel, down and around the lower wheel, up and over the other groove of the upper wheel to form a closed loop, and out horizontally through the opposite side wall of said housing, whereby movement of said wire through said housing causes rotation of said wheels, means for inducing an adjustable, predetermined electric current in the portion of the wire forming the loop between said wheels to heat the wire, said current inducing means including an inductor having primary windings, said windings surrounding vertical passageways positioned in spaced parallel relation between said wheels, a dielectric liner in each of said passageways, said wire loop extending between said wheels through said passageways, an autotransformer for applying an adjustable predetermined electric current to said inductor, a rotatable shaft in said housing, said lower wheel being mounted on said shaft, and an inertia switch associated with said shaft for interrupting the current between said inductor and said autotransformer at a predetermined minimum rotation of said shaft.

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