Jan. 1, 1963 L. A. KINGSLEY 3,071,486

METHOD AND APPARATUS FOR MARKING POLYTETRAFLUOROETHYLENE

Filed July 24, 1959

2 Sheets-Sheet 1

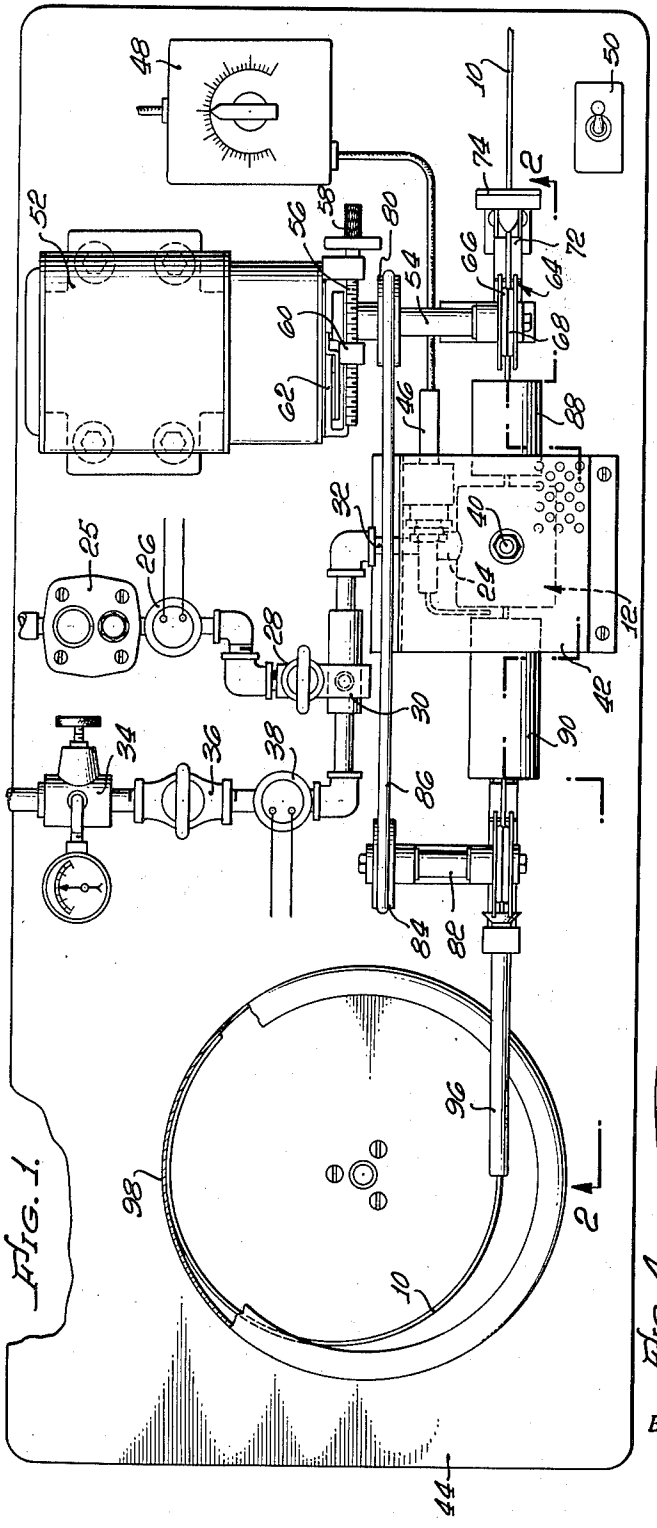


FIG. 1.

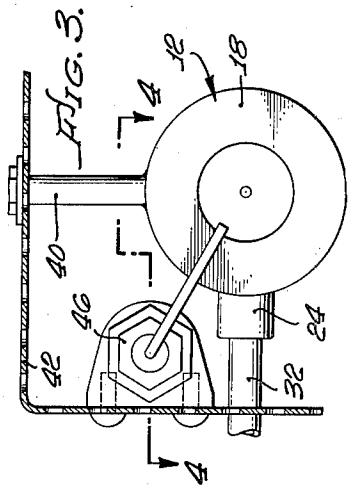


FIG. 3.

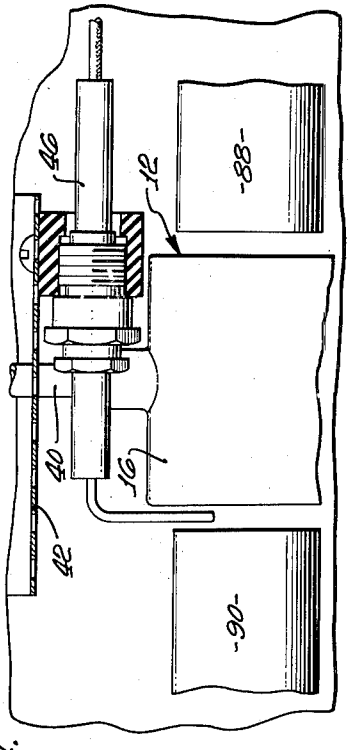


FIG. 4.

INVENTOR.
LEWIS A. KINGSLEY
BY Lyon & Lyon
ATTORNEYS.

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2 Sheets-Sheet 2

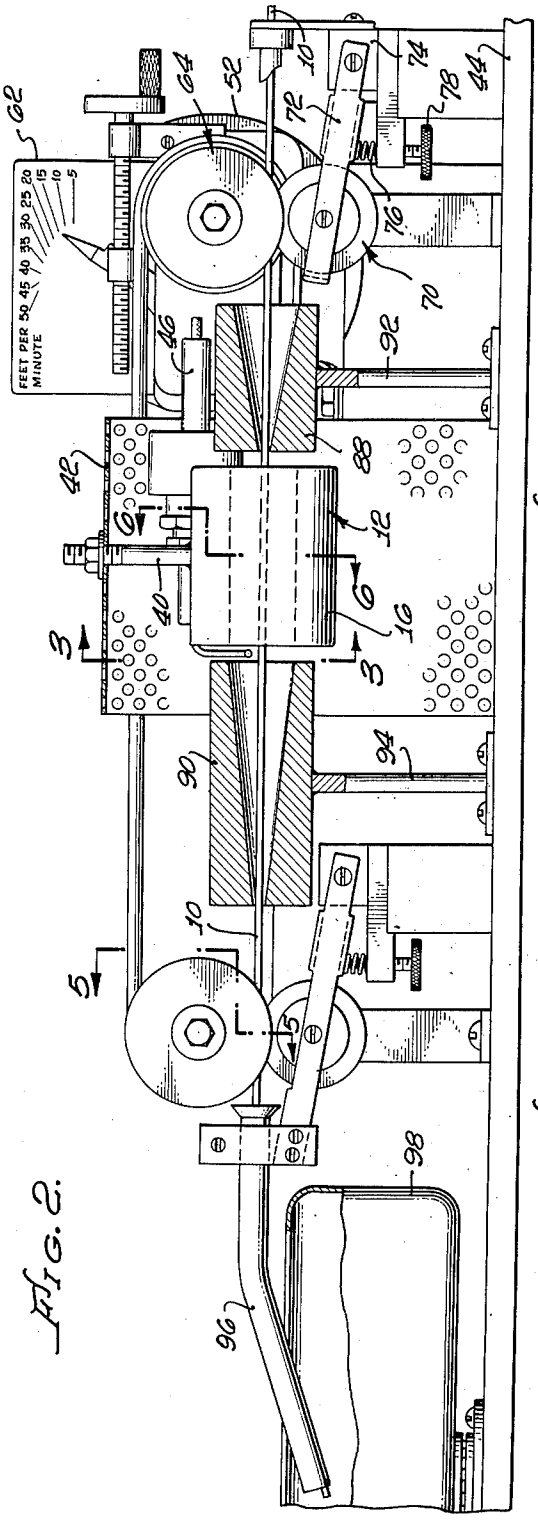


FIG. 2.

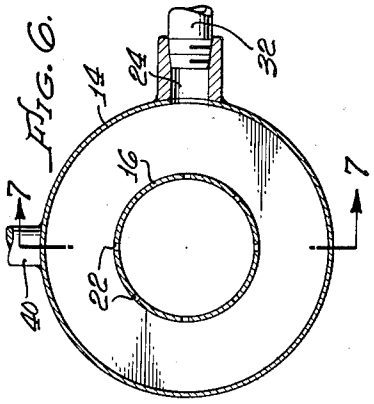


FIG. 6.

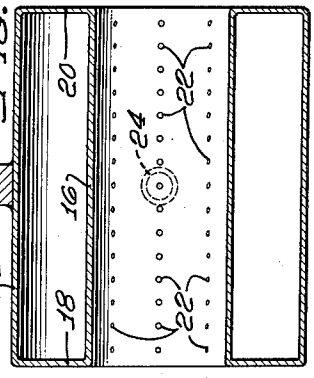


FIG. 7.

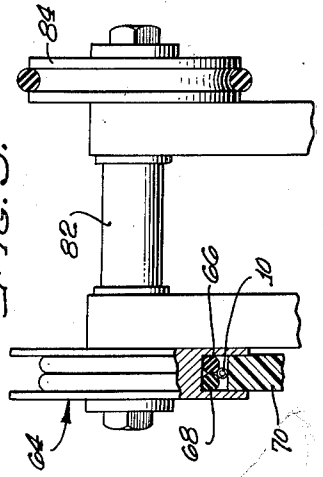


FIG. 5.

INVENTOR.
LEWIS A. KINGSLEY
BY Lyon & Lyon
ATTORNEYS.

United States Patent Office

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METHOD AND APPARATUS FOR MARKING POLYTETRAFLUOROETHYLENE

Lewis A. Kingsley, Beverly Hills, Calif. (% Kingsley Machine Co., 850 Cahuenga Blvd., Hollywood 38, Calif.)

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11 Claims. (Cl. 117—3)

This invention relates to a method and apparatus for marking on polytetrafluoroethylene coated wire.

It is desirable in constructing various aircraft and the like to utilize polytetrafluoroethylene coated wire for its well known characteristics. It is also desirable to mark wires used in such craft with code identifications of various combinations of letters and numbers. None of the heretofore known means of applying indelible markings on polytetrafluoroethylene coated wire was operative and attempts to use same resulted either in no marking at all or one which easily rubbed off.

The principal objective of this invention therefore is to provide a method and apparatus whereby polytetrafluoroethylene coated wire may be marked with a relatively permanent marking which will withstand handling and abrasion.

It is a further object of this invention to provide a method and apparatus wherein a portion of the marking foil is sintered or fused on to the outer surface of the polytetrafluoroethylene coated wire by application of heat.

It is still a further object of this invention to provide such a method and apparatus which will automatically place repeated relatively permanent markings on polytetrafluoroethylene coated wire in an efficient and rapid manner with a minimum of labor and risk to the operator.

Other objects and advantages will be apparent from the following description.

In the drawings:

FIGURE 1 is a top plan view of the heat applying structure.

FIGURE 2 is a view taken along line 2—2 of FIGURE 1.

FIGURE 3 is a view taken along line 3—3 of FIGURE 2.

FIGURE 4 is a view taken along line 4—4 of FIGURE 3.

FIGURE 5 is a view taken along line 5—5 of FIGURE 2.

FIGURE 6 is a view taken along line 6—6 of FIGURE 2.

FIGURE 7 is a view taken along line 7—7 of FIGURE 6.

Polytetrafluoroethylene coated wire 10 is first stamped with the desired indicia at the desired intervals by a hot stamping machine of the type shown for example in Kingsley Patent No. 2,517,493 issued August 1, 1950, for "Wire Stamping Machine." The marking temperature range is approximately 400° F. to 445° F. to avoid the possibility of dielectric damage to the polytetrafluoroethylene insulation and avoid release of toxic vapors otherwise developed in exposing polytetrafluoroethylene to higher temperatures. The marking foil is formed by a mixture of polytetrafluoroethylene particles with the coloring ingredient, for example, bone black, applied to a mylar carrier strip. Upon a stamping within the required range a sufficient indentation is made to hold the coloring mixture and sufficient adherence is provided to resist further handling.

After the coated wire has been thus marked it is trained through oven 12, which will be hereinafter described in detail, and is subjected to a heat setting operation at a temperature in excess of the temperature at

which polytetrafluoroethylene begins to vaporize, which is between approximately 620° F. to 650° F. The oven is regulated so that an activating temperature of between 650° F. and 750° F. is reached on the marked surface of the polytetrafluoroethylene for approximately 1 to 2 seconds, this in effect fuses or welds the mixture of polytetrafluoroethylene and coloring ingredient to the coating. Excessive temperatures or excessive time exposure to the desired temperature destroys the bond and prevents permanent adherence of the marking as well as injuring the desirable properties of the polytetrafluoroethylene insulation. The size or diameter of the wire will dictate oven temperature and the time in which the wire must remain in the oven to reach the activating temperature on the polytetrafluoroethylene coating surface.

The apparatus used in carrying out the above described method involves a hot stamping machine as outlined above in which the marking is made upon the wire within the specified temperature range. The wire 10 upon discharge from the stamping machine is trained through oven 12. The oven comprises a pair of concentric cylindrical shells 14 and 16 having end walls 18 and 20, thus forming a cylindrical annulus. The inner shell has a plurality of perforations 22 therethrough while the outer shell has an inlet 24 for gas and air.

The gas is supplied from a suitable source (not shown) and flows through a suitable pressure regulator 25, a solenoid operated control valve 26, a shut-off valve 28 and into a suitable check valve controlled union 30 and then through pipe 32 to inlet 24. Air under pressure is supplied from a suitable source (not shown) through a pressure regulator 34, a shut-off valve 36, a solenoid operated control valve 38 to union 30 and pipe 32 to inlet 24.

Oven 12 is suspended by bolts 40 from a U-shaped safety guard 42, which is bolted to platform 44 and provided with perforations to permit escape of heat. Also supported within guard 42 is a spark plug 46 energized by a suitable transformer 48 mounted upon platform 44.

A three-position switch 50 is provided which in one position is, of course, off and in a second position energizes the solenoid valves 26 and 38 to permit flow of gas and air in proper sequence and completes the spark plug circuit to fire the plug and hence the gas to heat oven 12 to the prescribed temperature.

In the third position the switch energizes in addition to solenoid valves 26 and 38 an electric motor 52 having a driven shaft 54. A speed control is provided by bolt 56 rotated by handle 58 and carrying traveling nut 60. As the bolt is rotated the nut travels thereon varying a resistance in the motor circuit and hence the motors speed which is indicated on panel 62.

At its outermost extremity drive shaft 54 carries a drive roller 64 formed with two neoprene rings 66 and 68 mounted upon a pulley. A driven roller 70 is rotatably mounted upon arm 72 pivotally mounted upon standard 74 and biased upwardly by spring 76 which in turn is adjusted by set screw 78. The driven roller has a flattened neoprene surface thereon so that wire 10 is gripped between the drive and driven rollers and moved through the oven 12. At the rear of the oven a similar wire driving assembly is provided the details of which as well as that in front of the oven being illustrated in FIG. 5.

Mounted upon drive shaft 54 is a pulley 80. Similarly upon shaft 82 of the rear drive mechanism is a pulley 84. A suitable belt 86 interconnects pulleys 80 and 84 so that shaft 82 is driven. Pulley 84 is slightly smaller than pulley 80 and hence shaft 82 rotates slightly faster than shaft 54 keeping the wire 10 taut. To further avoid any sag in wire 10 and to maintain same centrally disposed in oven 12 a pair of guides 88 and 90 are mounted upon pedestals 92 and 94 in turn mounted upon platform 44. Each guide has a conical bore with the small end

slightly larger than the wire and faced towards the discharge of the machine. After the wire has passed through the oven it enters tube **96** and is discharged into the rotatably mounted accumulator **98** in which it is coiled.

It is desirable to maintain a loop of wire between the stamping machine and the front drive mechanism for the oven and to synchronize driving the motor **52** and the stamping machine to permit stopping of the wire in both the stamping machine and the oven and to avoid interference between the two machines.

While what hereinbefore has been described as the preferred embodiment of this invention, it is readily apparent that alterations and modifications may be resorted to without departing from the scope of this invention and such alterations and modifications are intended to be included within the scope of the appended claims.

I claim:

1. A method for marking polytetrafluoroethylene comprising first making an impression in a polytetrafluoroethylene surface, depositing a mixture of polytetrafluoroethylene particles and coloring ingredient in said impression, and subsequently heating said surface to its vaporization point for a period of time sufficient only to heat-set and fuse said mixture to said polytetrafluoroethylene in said impression.

2. A method for marking polytetrafluoroethylene comprising first making an impression in a polytetrafluoroethylene surface, heating said surface to approximately 400° F. to 425° F. during the making of said impression, depositing a mixture of polytetrafluoroethylene particles and coloring ingredient in said impression, and subsequently heating said surface to its vaporization point for a period of time sufficient only to heat-set and fuse said mixture to said polytetrafluoroethylene in said impression.

3. A method for marking polytetrafluoroethylene comprising first making an impression in a polytetrafluoroethylene surface, heating said surface to approximately 400° F. to 425° F. during the making of said impression, depositing a mixture of polytetrafluoroethylene particles and coloring ingredient in said impression, and subsequently heating said surface to between 650° F. to 750° F. for a period of time sufficient only to heat-set and fuse said mixture to said polytetrafluoroethylene in said impression.

4. A device for marking polytetrafluoroethylene coated wire with indicia comprising a stamping machine, means in said machine for creating an impression in a polytetrafluoroethylene surface to be marked and depositing a mixture of polytetrafluoroethylene particles and coloring ingredients in said impression, an oven, and means for moving said polytetrafluoroethylene surface through said oven.

5. A stamping machine for marking polytetrafluoroethylene coated wire comprising means creating an impression in said polytetrafluoroethylene coating and depositing a mixture of polytetrafluoroethylene particles and coloring ingredient therein, an oven, and a wire feeding mechanism on either side of said oven moving said wire through said oven.

6. A stamping machine for marking polytetrafluoroethylene coated wire comprising means creating an impression in said polytetrafluoroethylene coating and depositing a mixture of polytetrafluoroethylene particles and coloring ingredient therein, an oven, and a wire feeding mechanism on either side of said oven moving said wire through said oven, one of said wire feeding mechanisms feeding faster than the other to maintain said wire taut in said oven.

7. A stamping machine for marking polytetrafluoroethylene coated wire comprising means creating an impression in said polytetrafluoroethylene coating and depositing a mixture of polytetrafluoroethylene particles and coloring ingredient therein, an oven, a wire feeding mechanism on either side of said oven moving said wire through said oven, one of said wire feeding mechanisms feeding faster than the other to maintain said wire taut in said oven, and additional wire guides adjacent the inlet and outlet of said oven.

8. A stamping machine for marking polytetrafluoroethylene coated wire comprising means creating an impression in said polytetrafluoroethylene coating and depositing a mixture of polytetrafluoroethylene particles and coloring ingredient therein, an oven, and a wire feeding mechanism on either side of said oven moving said wire through said oven, said oven surrounding said wire and symmetrically disposed with respect thereto.

9. A stamping machine for marking polytetrafluoroethylene coated wire comprising means creating an impression in said polytetrafluoroethylene coating and depositing a mixture of polytetrafluoroethylene particles and coloring ingredient therein, an oven, and a wire feeding mechanism on either side of said oven moving said wire through said oven, one of said wire feeding mechanisms feeding faster than the other to maintain said wire taut in said oven, said oven surrounding said wire and symmetrically disposed with respect thereto.

10. A stamping machine for marking polytetrafluoroethylene coated wire comprising means creating an impression in said polytetrafluoroethylene coating and depositing a mixture of polytetrafluoroethylene particles and coloring ingredient therein, an oven, a wire feeding mechanism on either side of said oven moving said wire through said oven, one of said wire feeding mechanisms feeding faster than the other to maintain said wire taut in said oven, and additional wire guides adjacent the inlet and outlet of said oven, said oven surrounding said wire and symmetrically disposed with respect thereto.

11. A stamping machine for marking polytetrafluoroethylene coated wire comprising means creating an impression in said polytetrafluoroethylene coating and depositing a mixture of polytetrafluoroethylene particles and coloring ingredient therein, an oven, a wire feeding mechanism on either side of said oven moving said wire through said oven, and additional wire guides adjacent the inlet and outlet of said oven.

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