March 13, 1934. J. E. SMITH 1,951,176

COATING MACHINE AND PROCESS

Original Filed July 28, 1931

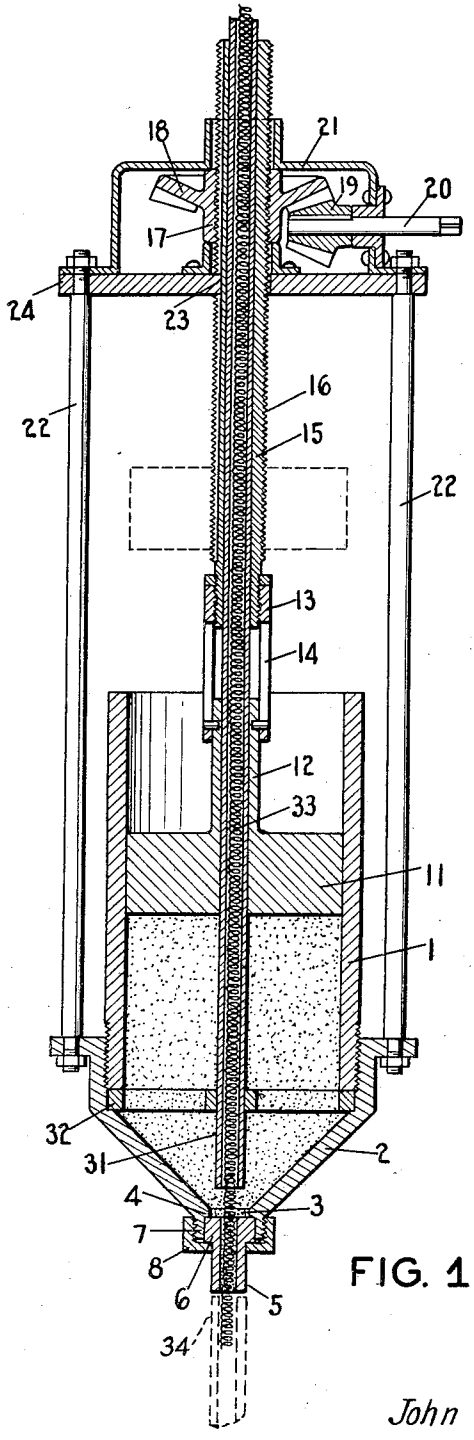


FIG. 1

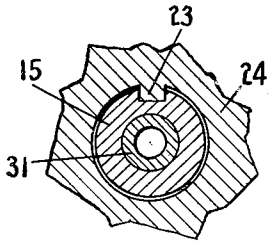


FIG. 3

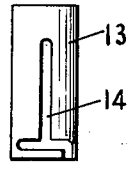


FIG. 2

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COATING MACHINE AND PROCESS

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Application July 28, 1931, Serial No. 553,572
Renewed December 11, 1933

6 Claims. (Cl. 18—13)

The present invention relates to mechanism for applying a coating of argillous material to solid elements and is shown more particularly in connection with the coating of electrical resistance elements.

The machine may be used in practicing the process and in producing the coated elements described and claimed in my copending application, Ser. No. 553,571, filed July 28, 1931.

Briefly, that application describes the coating of solid elements generally and is shown more particularly in connection with the coating of electrical resistance elements to be used in electrical appliances such as stoves, hot-air heaters, electric irons, etc.

The argillous material is somewhat in the nature of a ceramic material of electrical insulating properties and is coated upon the resistance element by the same pressure and in the same operation which extrudes the coating and the coated element from the machine. Such a process permits the continuous formation of a coated insulated element.

It is one object of my invention to provide a machine for carrying out the aforementioned process in a continuous manner.

It is another object of my invention to provide a machine wherein a resistance element is fed inside the machine where it is coated with an argillous material, and the coated element is ejected from the machine.

It is a further object of my invention to provide a machine of the above indicated character with a tapered head for directing the flow of argillous material in coating the element.

It is a still further object of my invention to provide a machine of the above indicated character wherein the pressure necessary to extrude the argillous material from the machine is sufficient to coat the element and also to extrude the coated element from the machine.

It is a still further object of my invention to provide a machine of the above indicated character with interchangeable nozzles for producing varying sizes and shapes of coated elements.

Other and further objects of my invention will be apparent from the following specification taken in conjunction with the accompanying drawing, wherein—

Figure 1 is a vertical section of one embodiment of the machine of my invention;

Fig. 2 is a detail of the connection permitting the removal of the piston; and

Fig. 3 is another detail showing the key and slot arrangement for the piston operating shaft.

A cartridge of the body or paste is introduced into a machine into which is also introduced the heating element that is to be coated. Pressure is then applied to the cartridge so as to extrude the plastic body from the machine through a nozzle provided for that purpose. The element to be coated is introduced into the nozzle and is ejected from the machine by the same force and the same action that extrudes the plastic material from the machine. As the element and the plastic material emerge from the machine, the plastic material is coated upon the element and clings thereto. The coated element may then be wound or shaped into any form desired, and the contiguous layers of the coated element may touch each other without danger of damaging the electrical resistor element or of damaging the coated element. The element is then baked so as to dry the same and harden it. The element may or may not be introduced into a casing or sheathing.

The machine comprises a cylinder 1 having screwed thereupon a head 2 which is tapered to a reduced discharge mouth 3. The mouth 3 is provided with an annular shoulder 4 against the outside of which rests the rear end of a removable nozzle 5 The nozzle 5 has a shoulder 6 extending beyond the rim 7 of the mouth 3 which shoulder is engaged by a cap 8 that screws upon the rim 7 so as to secure the nozzle 5 firmly in the mouth 3

A plunger or piston 11 is adapted to be moved back and forth in the cylinder 1 The connecting rod 12 that is attached to the piston head 11 has a sleeve 13 secured thereto, by means of a bayonet and slot connection 14 shown in detail in Fig. 2. On the opposite end the sleeve 13 is secured to a hollow shaft 15 which is externally screw threaded as indicated at 16. Cooperating with the screw threaded portion of shaft 15 is a nut 17 which nut forms part of the hub of a bevel gear 18. A second bevel gear 19 cooperates with the bevel gear 18 and has a shaft 20 which is connected to a source of power (not shown) in any appropriate manner. The bevel gears are securely mounted in a housing 21 which is held in position with respect to head 2 by means of a plurality of spacer rods 22. The shaft 15 is provided with a key way or slot with which key 23 cooperates to prevent the shaft from turning as the gears 18 and 19 rotate. The key 23 is integral with plate 24 forming part of the housing 21.

It will be obvious from this simple assembly that when power is applied to the shaft 20 to turn the bevel gear 19, the bevel gear 18 will

be rotated which will rotate the nut 17 causing the shaft 16 and the connected piston head 11 to travel inwardly or outwardly according to the direction of rotation of the gears

The following is the procedure when loading the machine:

The piston 11 is withdrawn in the cylinder 1 as far as possible by operation of the screw 16. The bayonet joint 14 between the sleeve 13 and piston rod 12 is unlocked and the rod 12 is telescoped into the sleeve 14 so as to remove the piston from the cylinder as shown in the dotted line position on Fig. 1. A cartridge of my plastic or argillous coating material is then introduced into the cylinder.

After the cartridge is introduced the piston head is inserted in the cylinder 1 and the bayonet joint 14 is relocked. Further movement of the piston head 11 by rotation of the driving nut 17 will exert pressure upon the cartridge which will compress the same downwardly in the cylinder toward the head 2. The beveled inner surface of the head 2 will direct the material toward the discharge mouth 3 and the nozzle 5 mounted therein. Further pressure will force or extrude the material 3 through the opening in the nozzle 5.

The resistor element that is to be coated is introduced into the machine and rests in a tubular carrier 31 which extends through a central bore in the piston, the piston rod 12, the sleeve 13 and the hollow shaft 15 projecting beyond the upper end of the cylinder 1 as shown in Fig. 1. The inner end of the tube 31 is maintained centrally disposed in the head 2 by means of a spider wheel 32 that is locked between the cylinder 1 and head 2, the end of the tube 31 being maintained spaced from the inner end of the nozzle 5, which permits the passage of the argillous material into the nozzle 5 as described above The resistance element is indicated at 33 as a coiled wire which extends beyond the tube 31 and through the bore of the nozzle 5. The wire may be fed from a continuous supply (not shown) located outside of the machine as shown in the drawing.

As further pressure is exerted upon the cartridge of plastic material and the material is extruded through the bore of the nozzle 5, the pressure and force necessary to extrude the material forces it upon and applies it to the element 33 both in the space between the inner end of the tube 31 and the inner end of the nozzle 5, and also in the bore of the nozzle 5. Likewise, this same pressure that is used to extrude the plastic material from the nozzle 5 is sufficient to carry the coated element out of the machine. It is apparent that so long as this pressure continues forcing the piston head 11 inward, and there is sufficient plastic material in the cylinder 1, the resistance element will be coated and also ejected or extruded from the nozzle 5 in a continuous flow.

This same process and mechanism for coating a resistance element with argillous material applies equally well whether the element being coated is of wire, or a strip of metal, or a grid, or a plate.

The same process and mechanism is applicable whether the element is metal, wood or other material. Likewise, the composition of the argillous material may be varied in accordance with the varying uses to which the finished article is to be put.

As the coated element is extruded from the nozzle 5, the same may be cut off in whatever length may be desired for the particular use to which the particular coated element is to be put. It may also be directly fed into a holder such as a tube or other sheath. The holder or sheath may be shaped as described and claimed in my copending application, Ser. No. 554,642, filed August 3, 1931. In that event, the holder would be received in suitable means for moving it in a path to lay the strands of coated element in the holder.

There is indicated in Fig. 1, in dash lines, a tube 34 placed immediately adjacent the discharge end of the nozzle 5. As the coated element is extruded from the nozzle 5, it passes directly into the end of the tube 34 and the extrusion pressure upon the coated material is sufficient to force the coated element into and along the tube or sheathing 34, thereby filling the same. If the sheathing 34 is flexible, then this sheathed, coated element may be formed and twisted into any shape desired as described above, and the layers of the sheathing may contact each other without danger of short circuit.

It is further apparent that varying sizes and shapes of elements may be obtained by changing the nozzles 5, each nozzle being provided with whatever shape and size of bore desired. It is apparent that different shapes and sizes of coated elements may be made by merely interchanging nozzles and without disturbing any other part of the machine.

Other modifications may be made in the arrangement and location of parts of my machine that are within the spirit and scope of my invention, and such modifications are intended to be covered by the appended claims.

I claim:

1. A machine for coating solid elements with argillous material and comprising a cylinder for holding the material, a nozzle communicating with the cylinder, means for holding the element to be coated between the cylinder and the nozzle, and means for extruding the material from the nozzle, the pressure of extrusion being used to coat the material upon the element, to feed the element through the machine, and to extrude the coated element from the machine and feed the same into a casing.

2. A machine for coating electrical resistance elements with argillous material comprising a cylinder for holding the material, a tapered head on the cylinder, a nozzle in said head, a plunger operable in said cylinder, a holder for the resistance elements extending into the tapered head and spaced from said nozzle, and means for moving the piston forwardly so as to extrude the argillous material from the nozzle, the pressure serving to apply a coating of the material to the resistance element between the holder and the nozzle and to engage the surface of the resistance element and thereby extrude the coated element from the machine.

3. A machine for coating a coiled electrical resistance element with argillous material comprising a container for plastic argillous material, a nozzle, means for applying pressure to said argillous material to force it through said nozzle, a tubular guide extending into said argillous material and terminating at a point spaced from said nozzle and adapted to have a coiled electrical resistance element freely slidable therethrough and to guide it centrally to said nozzle and to prevent contact of said argillous material therewith except after said coiled electrical resistance element has left said guide.

4. A machine for coating a coiled electrical re-

sistance element with argillous material comprising a cylinder for holding the material, a tapered head on said cylinder, a nozzle in said head, a holder for the resistance element extending into said tapered head and spaced from said nozzle and means for applying pressure on the material within the cylinder to extrude the material from the nozzle, the pressure serving to apply a coating of the material to the outside of the coiled resistance element and fill the interior thereof while the element is between the holder and the nozzle and to engage the surface of the resistance element and thereby extrude the coated element from the machine.

5. A machine for coating a coiled electrical resistance element and filling the interior thereof with argillous material comprising a container for plastic argillous material, a nozzle, means for applying pressure to said argillous material to force it through said nozzle, a tubular guide extending into said argillous material and terminating at a point spaced from said nozzle and adapted to have a coiled electrical resistance element freely slidable therethrough and to guide it centrally to said nozzle and to prevent contact of said argillous material therewith except after said coiled electrical resistance element has left said guide.

6. A machine for coating electrical resistance elements with argillous material comprising a container for holding the material, a head on the container, a nozzle in said head, means operable in said container for exerting pressure on the material tending to extrude it from the container and through the nozzle and a holder for the resistance elements extending into said head and spaced from said nozzle, the pressure extruding the argillous material from the nozzle serving to apply a coating of the material to the resistance element between the holder and the nozzle, serving to fill the interior thereof with argillous material and serving to engage the surface of the resistance element and thereby extrude the coated resistance element from the machine.

JOHN E. SMITH.