July 13, 1948. H. B. MUNGER ET AL 2,445,035

METHOD OF AND MACHINE FOR PACKING POWDER FOR SPARK PLUGS

Filed Jan. 20, 1944

3 Sheets-Sheet 1

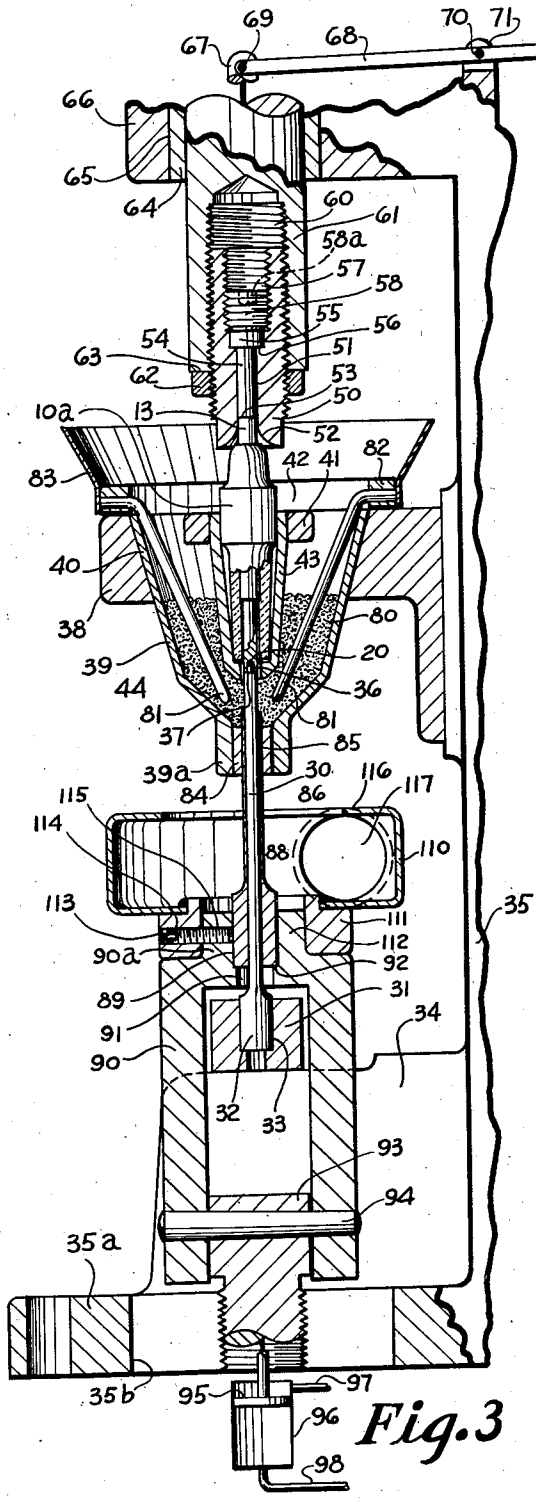


Fig. 3

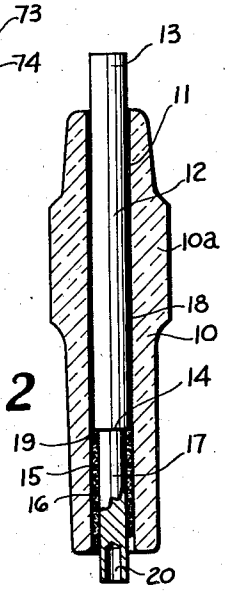


Fig. 2

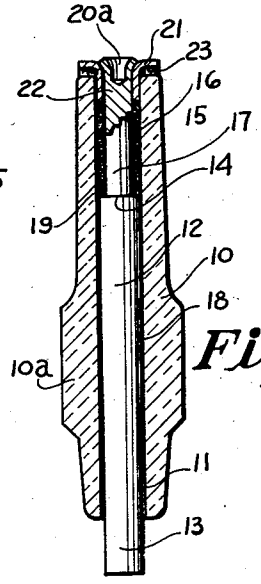


Fig. 1

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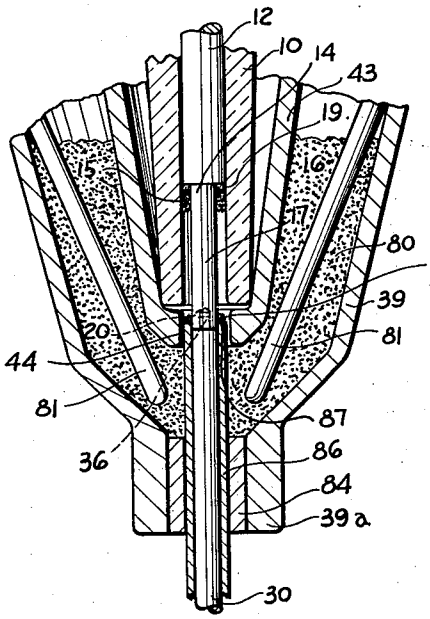


Fig. 4

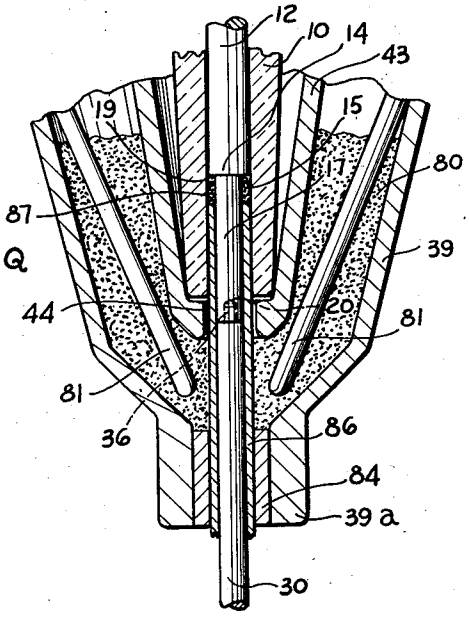


Fig. 5

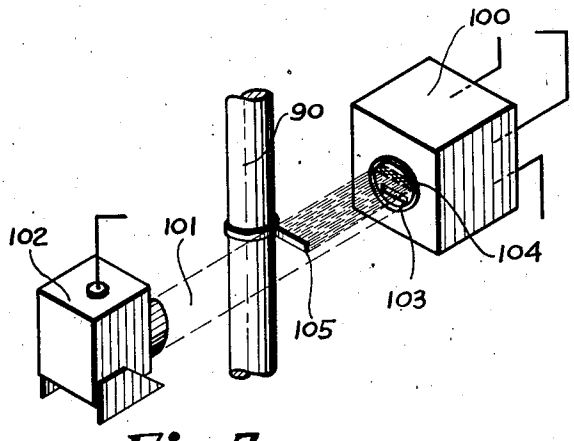


Fig. 7

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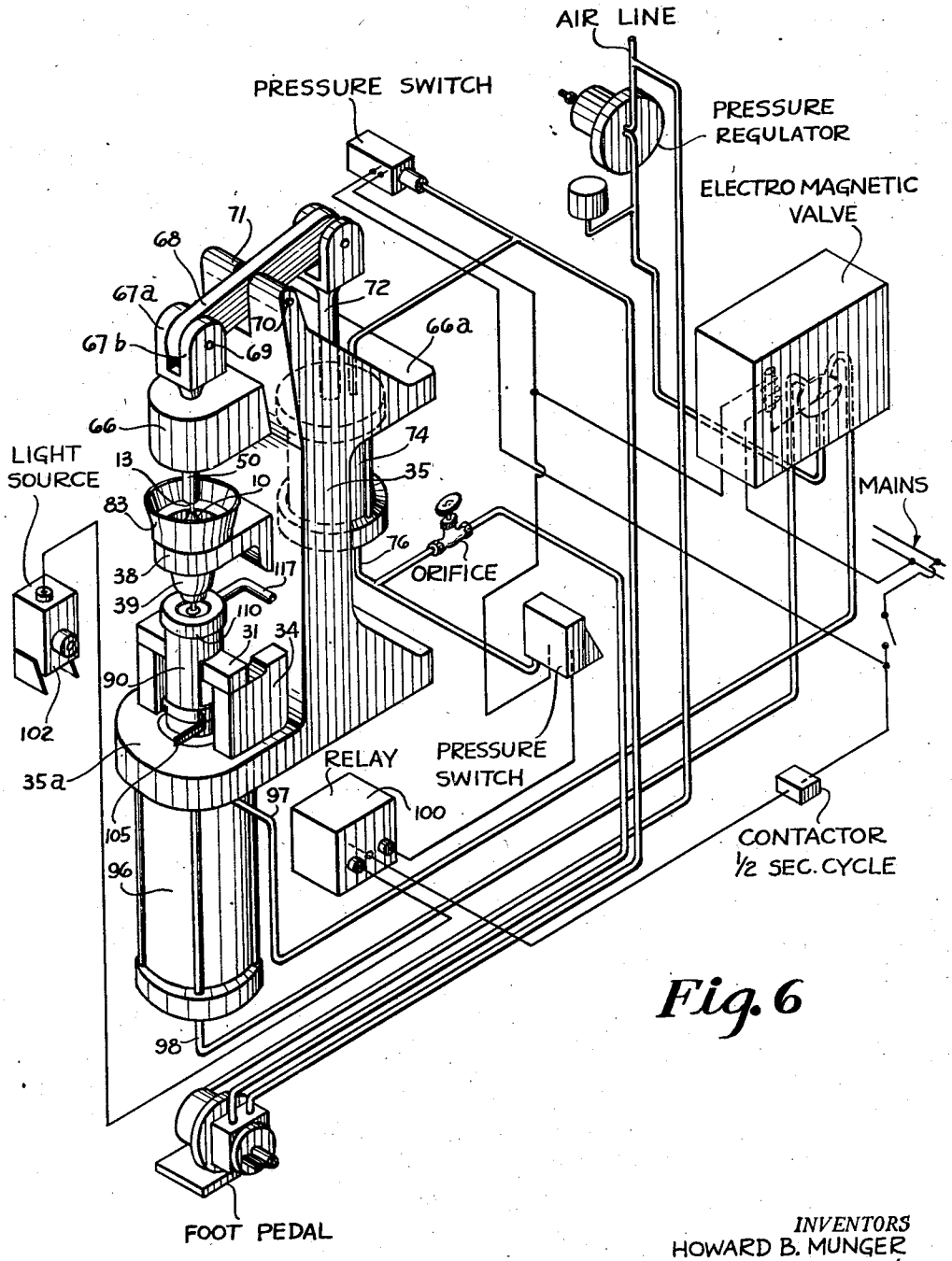


Fig. 6

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Patented July 13, 1948 2,445,035

UNITED STATES PATENT OFFICE

2,445,035

METHOD OF AND MACHINE FOR PACKING POWDER FOR SPARK PLUGS

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Application January 20, 1944, Serial No. 519,010

6 Claims. (Cl. 18—1)

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This invention relates to spark plugs, more particularly to a method of, and a machine for, positioning compactable powder in a spark plug insulator core for sealing a center electrode in the bore thereof.

When compactible powders, such as talc, are used to seal a center electrode in the bore of an insulator of a spark plug, a production problem arises in positioning the compactible powder in a narrow annular space between the electrode and the insulator due to the fact that considerable force is necessary to compact the powder sufficiently in the narrow annual space to result in a self-sustaining sealing body. It is a characteristic of compactible powder, particularly of talc, that it must be compacted in position in the narrow annular space in shallow layers, otherwise the compacting force, usually applied by a reciprocating ram, will not be distributed evenly through the body of the loose powder and a "bridging" results whereby the upper portion of the layer of loose powder is firmly packed together while the powder below this layer will not have the compacting force applied to it, allowing it to remain loose and substantially uncompacted so that functionally it will not serve the purpose of sealing the electrode in the insulator. It has already been suggested that this problem may be solved by changing the characteristics of the powder to improve its "flowing" qualities so that the "bridging" of the powder will be obviated to allow the powder to be compacted in relatively thick layers. A self-sustaining sealing body of compacted powder may be compacted into position between the electrode and the bore of the insulator under these circumstances in three separate relatively thick layers.

The present invention contemplates the provision of a method of positioning compactible powder to form a holding and sealing body between a center electrode and the bore of an insulator wherein the powder is carried into the narrow annular space in relatively small increments which are readily compacted without "bridging." This invention further contemplates the provision of a machine which conveniently carries out the method delineated above which is cheap and makes possible very uniform results when used in a mass production line for producing spark plugs in large quantities.

By the present method, as carried out by the machine disclosed herein, the powder is compacted in position in as small a layer as may be found practicable. For example, it is possible by the use of this method and machine to position a

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sealing body of compacted powder in the narrow annular space between the electrode and insulator of a spark plug in approximately 20 small layers which may be controlled to suit the conditions under which the compacting occurs and taking into consideration the uniformity of the results obtained.

This invention contemplates inverting the spark plug insulator and electrode over a loose layer of the compactible powder, and holding in such position by a suitable means adjacent to a vertically reciprocating ram which is adapted to move into and out of the narrow annular space between the center electrode and the insulator while moving with each reciprocation through the loose layer of compactible powder. The face of the ram is provided with a flat horizontal surface which, upon passing through the loose layer of compactible powder, has heaped upon it a small increment of the loose powder which is then carried by the ram during its upward movement into the narrow annular space between the electrode and the insulator bore to be compacted against the floor of the narrow annual space. Thereafter the ram continues to reciprocate in timed relation under control of an automatic actuating means.

In each reciprocation the ram passes through the layer of loose powder to pick up a new increment of the compactible powder which is carried upwardly into the narrow annular space and compacted into position to form a self-sustaining body, sealing the electrode in the insulator bore. Automatic control means are provided to give a timed relation between the holding and guiding devices which secure the electrode and insulator in position with reference to the ram and to control the reciprocation of the ram until a predetermined amount of powder has been compacted in position, whereupon an electric control stops the reciprocation and allows the operator to remove the packed spark plug insulator from the machine by actuating a manual over-control and thereafter to insert a new insulator and electrode in position in the machine to begin a new cycle by again actuating the manual over-control.

It is, therefore, a principal object of this invention to provide a method of compacting a self-sustaining holding and sealing body in position in a narrow annual space formed between a center electrode and the bore of an insulator by carrying loose compactible material into the narrow annual space by the member which compacts the material in position to form the holding and sealing body.

It is a further object of this invention to provide a machine which will conveniently carry this method into practice and which is cheap, durable and capable of sufficient production to justify its use in a production line by giving uniformly good results at relatively high speed.

It is a further object of this invention to provide a machine adapted to compact a body of powder into a self-sustaining holding and sealing body in the narrow annular space between the center electrode and the bore of a spark plug which is substantially automatic in operation once a cycle has commenced and carries through the compacting of the self-sustaining body through to completion at one station in a production line.

It is a further object of this invention to provide a method of and a machine for compacting a self-sustaining holding and sealing body in position in a narrow annual space formed between a center electrode and the bore of an insulator whereby loose compactible material is carried into the narrow annular space in small increments by the member which compacts the material in position to form the holding and sealing body, all at one station in a production line.

Other objects and advantages of this invention relating to the arrangement, operation and function of the related elements of the structure, to various details of construction, to combinations of parts and to economies of manufacture, will be apparent to those skilled in the art upon consideration of the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

Fig. 1 is a cross-sectional elevation of a spark plug insulator with the center electrode in position therein.

Fig. 2 is a sectional elevation of the same insulator, similar to Fig. 1, just after the powder packing operation is completed.

Fig. 3 is an elevation, partly in section, of a machine incorporating the method of packing powder.

Fig. 4 is an enlarged sectional elevation of a machine portion adjacent the lower end of the spark plug insulator.

Fig. 5 is an enlarged sectional elevation of the same machine portion, shown in Fig. 4, showing the action of the compacting member.

Fig. 6 is a perspective view of the machine including a schematic diagram of an automatic control means.

Fig. 7 is an enlarged perspective view of a portion of the control means.

Referring to the drawings, particularly to Fig. 1, an insulator 10 is shown having an internal longitudinal bore 11 in which is positioned a cylindrical center wire 12, a portion 13 of which projects from the lower end of the bore to form the firing tip of the electrode. At the opposite end of the insulator, distal from the end from which projects the firing tip 13, a shoulder 14 is provided on the center electrode against which is compacted a body 15 of compactible powder, such as talc or the like, into a narrow annular space 16 formed between the bore 11 of the insulator and a reduced portion 17 of the electrode, the shoulder 14 providing a floor for the annular space.

As shown in Fig. 2, the powder is compacted into a self-sustaining body to seal the center electrode 12 in the bore 11 of the insulator by the positioning of the sealing body 15 in the annular space 16. A body of cement 18 is positioned between the center electrode and the bore, and, in order to prevent the escape and lodgment of this cement into the annular space 16, a washer 19 is positioned above the shoulder 14, which is preferably made of some heat-resisting material such as asbestos or the like. The end of the reduced portion 17 of the center electrode is provided with a short longitudinal bore 20 which forms a means for holding the center electrode in position during the compacting period, as will be described hereinafter, and also provides a convenient method for holding a terminal piece 21 (Fig. 1) in position upon completion of the insulator assembly. The terminal piece 21 is provided with a downwardly-extending flange 22 which extends into the annular space 16, having positioned around it a resilient washer 23 of asbestos after which the aperture 20 is peened as at 20a to hold the terminal piece 21 permanently in position on the insulator. The insulator assembly shown in Fig. 2 illustrates the condition of the insulator immediately after the packing operation is completed and before the terminal piece 21 is positioned thereon. The insulator assembly, as shown in Fig. 1, is complete and may be positioned directly into the shell (not shown) of a spark plug for the final assembly thereof.

Referring now to Fig. 3, the insulator shown in Fig. 2, first having the center wire 12 cemented in position as described above, is positioned between a fixed guiding means or spindle member 30 which is anchored to a bridge member 31 at its lower end by having an enlarged portion 32 fitted into a socket 33 therein. The bridge member 31 is positioned across a pair of buttresses 34 forming a part of a frame member 35 having a base 35a. The upper end of the guide member 30 is provided with an upwardly extending nib 36 which is adapted to fit into the aperture 20 of the center electrode 12. The end of the electrode 12 rests against a shoulder 37 on the guide member so as to support it in a fixed spatial relation with reference to the frame member 35 adjacent an outwardly extending ledge member 38 which supports a funnel member 39, whose function will be described hereinafter.

The ledge member 38 is provided with an aperture 40 in which the funnel member 39 is positioned, holding it in fixed relation with reference to the frame member 35 concentric with the guide member 30. Adjacent the upper side of the ledge member 38, a bridge 41 is provided to cross the aperture 40, the bridge having an aperture 42 adjacent its central location also in concentric relation with the axis of the guide member 30. A thimble 43 is positioned in the aperture 42 and is adapted to extend downwardly from the bridge 41 to cooperate with the upper end of the guide member 30 by means of an aperture 44 positioned in the bottom of the thimble, which is preferably relatively thick. The thimble bottom embraces the nib 36 positioned on the terminus of the guide member 30, the aperture being in concentric relation therewith. The inside diameter of the thimble 43, at its upper end, is sufficiently large to snugly embrace an enlarged portion 10a of the insulator while the inside dimension of the thimble adjacent its floor above the aperture 44 is of such a dimension to snugly embrace the terminal end of the insulator as contra-distinguished from the firing tip from which the portion 13 of the electrode projects. The insulator 10 and electrode 12 as assembled, as shown in Fig. 2 with the cement 18 in either wet or dry condition, are dropped into

the thimble 43 so that the end aperture 20 of the center electrode is in cooperative relation with the nib 36 with the terminal end of the insulator positioned adjacent the floor of the thimble and the enlarged portion 10a of the insulator snugly positioned in the upper end of the thimble.

A holding means 50 is then lowered to cooperate with the firing tip 13 of the center electrode to urge the electrode downwardly into cooperative fixed relation with the guiding means 30. The holding means 50 is in the nature of a threaded sleeve, having a central bore 51 which terminates at its lower end in a bell-shaped flaring portion 52 to cooperate with the firing tip 13 of the center electrode whereby the firing tip is centered with relation to the central bore 51. The firing tip 13 projects a predetermined distance into the central bore 51 to cooperate with the lower terminus 53 of a rivet 54 whose head 55 cooperates with the floor 56 of a threaded counterbore 57. The floor 56 is formed between the central bore 51, which is relatively small in diameter, being approximately the same diameter as the center wire 12, and the threaded counterbore 57, which is of relatively larger diameter, being approximately the same as the diameter of the head 55 of the rivet 54.

A threaded plug 58 fits into the threaded counterbore 57 to abut against the upper surface of the head 55 to hold it in fixed relation with reference to the central bore 51. The plug 58 is provided on its upper surface with a milled aperture 58a which is in squared or hexagonal conformation to cooperate with a tool (not shown) to move the plug by its threads downwardly into tight cooperative relation with the head 55 of the rivet. The threaded-sleeve holding member 50 is adapted to be threaded into a central aperture 60 of a reciprocating member 61 and is locked in position therein by means of a lock nut 62 which jams against the lower face 63 of the reciprocating member 61.

The reciprocating member 61 is journaled in a bearing 64 fitted into an aperture 65 of an outwardly extending portion 66 of the frame member 35. The upper end of the reciprocating member is provided, above the frame portion 66, with a bifurcated portion 67 having a pair of ears 67a and 67b (Fig. 6) between which a lever 68 is fitted and pinned thereto by means of a pintle 69. The lever 68 is pivoted about a pin 70 adjacent its central location, the pin 70 being fitted into an upwardly projecting portion 71 of the frame. The distal end of the lever 68 cooperates with the piston rod 72 by being pinned thereto, the piston rod being actuated by a piston 73 moving in a double-ended cylinder 74 as is shown schematically in Fig. 3. The ends of the cylinder 74, which may be conveniently attached to frame ledge 66a on the rear side of frame 35 (Fig. 6), in which fluid pressure may act against the opposite sides of the piston 73 to reciprocate the piston, are in communication with a source of fluid pressure by means of pipes 75 and 76. When fluid pressure is applied to the upper side of the piston 73 by being introduced by pipe 75, the piston 73 moves downwardly so as to have holding means 50 move from its cooperative relation with the firing tip 13 of the spark plug electrode. In the same manner, when fluid pressure is introduced in the cylinder 74 on the lower side of piston 73 by means of pipe 76, the piston 73 is moved upwardly to move the holding means 50 into cooperative relation with the firing tip 13 of a spark plug insulator assembly which is positioned in the thimble 43. The fluid pressure is under manual control by an operator in conjunction with an automatic device as will be set forth in detail hereinafter.

The construction already described discloses a means whereby an insulator assembly of a spark plug may be held in fixed relation with reference to the guide means 30 and the funnel means 39. The object to be accomplished by the present device is to provide a construction which may be used to carry into effect a method of compacting powdered material which is capable of being compacted into a holding and sealing body, such as talc, between a center wire and the bore of an insulator, a narrow annular space being provided between the parts. By referring to Fig. 3 of the drawings, it is clear that the insulator assembly is held in a position so that the narrow annular space 16 positioned between the center electrode and the bore of the insulator opens downwardly adjacent the aperture 44 of the thimble 43. The aperture 44 is in concentric relation with the guide means 30 which projects into the aperture from the lower side of the thimble and cooperates with the aperture 20 formed in the lower end (terminal end) of the center electrode as shown in Fig. 2.

The funnel 39 forms a convenient container for compactible material, such as talc 80, which is conveniently dropped therein from the upper open end of the funnel 39. The talc is conveniently agitated manually by downward extending fingers 81 which are attached to a ring 82 having a diameter substantially the same as the upper end of the funnel. The ring 82 rests on the top side of the frame member 38 and is provided with an upwardly extending flaring flange 83 to aid an operator to position talc into the funnel 39. The fingers 81 extend to substantially the bottom of the funnel 39 adjacent the upper end of the guide means 30 and maintain the powder in loose condition so as to be readily moved into position by a means which will be described hereinafter.

The funnel 39 is provided at its lower end with a tubular portion 39a in which is positioned a journal means 84 through a central aperture 85 of which is reciprocated a ram member 86 which is positioned concentrically with and moves longitudinally along the guide means 30. The ram is in the nature of a tube fitting closely about the guide means 30 and having a flat upper surface 87 as is best illustrated in Fig. 4. The lower portion of the ram is provided with an enlarged portion 88 which is fixed into a shouldered aperture 89 of a stirrup 90 which embraces the bridge member 31 and moves between the frame members 34 as is most clearly shown in Fig. 6. The aperture 89 is provided with a smaller counterbore 91 to form a shoulder 92 against which rests the enlarged portion 88 of the ram. The guide means 30 is adapted to project through counterbore 91 into the hollow portion of the tubular ram as has already been described. The bridging member 90a of the stirrup 90 cooperates on its lower side with the top surface of the bridge 31 to determine the lowest point of the stroke of the ram and is preferably so devised that the upper surface 87 of the ram is approximately flush with the upper surface of the journal means 84 through which the ram reciprocates.

In order to reciprocate the stirrup 90, and the ram 86 fixedly attached thereto, the stirrup is fixed to a piston rod 93 by means of a pin 94 positioned in aligning apertures in both members. The piston rod 93 is adapted to be moved

by a piston 95 which reciprocates in a double-ended cylinder 96 as is shown schematically in Fig. 3. The cylinder 96 is conveniently attached to frame member 35a in any manner well known in the art, the piston actuating the rod 93 through aperture 35b in the frame member 35a. The upper end of the cylinder 96 is provided with a pipe 97 which is in communication with a controlled source of fluid pressure to move the ram downwardly out of the narrow annular space formed between the bore of the insulator and the center wire until the lower surface of the bridge member 90a contacts the upper surface of the bridge member 31 which determines the lowest point of the downward stroke. The lower portion of the piston 96 is provided with a pipe 98, which is also in communication with the same source of controlled fluid pressure, being adapted to allow the fluid pressure to act against the lower side of the piston 95 to move the saddle member 90 and the ram 86 upwardly into cooperative relation with the spark plug insulator assembly to carry the powder into the narrow annular space 16 and also to compact the same therein as will be described in further detail hereinafter.

Referring particularly to Figures 3, 4 and 5 of the drawings, an insulator 10 with a center electrode 12 cemented in position in the bore thereof, is placed in position in the thimble 43 with the small longitudinal bore 20 in the end of the center electrode 12 embracing the nib 36 on the end of guide means 30 so that the end of the electrode is abutted against the shoulder 37. An operator then actuates a manually-controlled valve means which places the pipe 76 of the cylinder 74 in communication with a source of fluid pressure, the piston 73 of cylinder 74 having in the meantime been moved to its lowest position by placing the pipe 75 in communication with the source of fluid pressure to raise the holding means 50 to its uppermost position. The fluid pressure entering the pipe 76 will move the piston 73 upwardly in the cylinder 74 to move the holding means 50 downwardly by actuating the lever 68 about the pivot 70 to engage the holding means with the firing tip 13 of the insulator-electrode assembly previously placed in position in the thimble 43 by an operator. By this action an operator has placed a center electrode with its insulator in a fixed predetermined position upon the fixed guide means 30 with its terminal end, with the opposite or firing end of the electrode cooperating with the holding means 50 and the end face of the terminal firing tip 13 abutting against the terminus 53 of the rivet 54.

A cycle of packing operations may now be started and the operator, by means of a manual control, initiates the cycle by placing an automatic control means, as disclosed in Fig. 6, in control of the flow of fluid pressure to pipes 97 and 98 to cylinder 96 whereby piston 95 is moved upwardly and downwardly in a timed relation as is determined by a contactor operating on preferably a one-half second cycle to control an electromagnetic valve which directs the fluid pressure to pipes 97 and 98 alternately to move the ram upwardly and downwardly as the piston responds to the fluid pressure on either side. The movement of the piston 95 is transmitted to piston rod 93, thence to stirrup 90 through the action of pintle 94 and then to the ram 86 which reciprocates vertically about the guide means 30 which is positioned within the tubular portion of the ram. As the ram 86 moves upwardly, the flat upper face thereof moves through the layer of loose compactible material positioned in the funnel 39 by the operator dumping the compactible powder into the open end thereof, being aided by the flaring funnel 83. As the flat upper face 87 of the ram 86 moves through the loose powder, a small quantity Q thereof is heaped on the upper face, as is clearly shown in Fig. 4, which remains on the upper face of the ram and is carried into the narrow annular space 16 formed between the attenuated portion 17 of the center electrode 12 and the bore 11 of the insulator and is carried upwardly to be compacted against the asbestos washer 19 which is supported by the shoulder 14 of the center electrode. The force necessary to compact the powder is conveyed upwardly by the center electrode 12, being transmitted to the holding means 50 by means of the rivet 54 whose lower face 53 cooperates with the firing tip 13 of the electrode.

The pipe 97 is then placed in communication with the source of fluid pressure by the automatic control means, particularly by the electromagnetic valve as shown in Fig. 6 under control of the contactor, to move the piston 95 downwardly and to simultaneously move the ram 86 downwardly to its initial position. A new stroke is then inaugurated by the contactor and the electromagnetic valve by placing the pipe 98 in communication with the source of fluid pressure to again move the ram 86 through the layer of loose powder so that a second small increment of powder is positioned on the upper face 87 thereof which is carried thereby into the narrow annular space, being compacted against the first increment which has already been carried and compacted into position. This reciprocation is continued until a predetermined amount of compactible material has been carried into the annular space to form the holding and sealing body between the center electrode and the bore of the insulator. Preferably the packing cycle is stopped before the compacted material 15 completely fills the narrow annular space, as is clearly shown in Fig. 2, so that the flange 22 of the terminal 21 may extend into the annular space as shown in Fig. 1.

Inasmuch as talc and other compactable powders have a tendency to flow less readily than desirable, the operator must agitate the powder adjacent the lower end of the funnel by fingers 81 to maintain a constant supply of loose powder available to be picked up by the upper face 87 of the ram to be carried into the annular space and placed in final position in the holding and sealing body formed in the annular space.

It is convenient to incorporate a photoelectric cell relay 100 in combination with the automatic control means which cooperates with a light beam 101, coming from a light source 102, and a slot 103 formed in an opaque shield 104 in combination with an opaque projection 105 attached to the stirrup 90, all as is clearly shown in Fig. 7. As the stirrup 90 is moved downwardly by an increase in volume of the compacted powder 15, positioned in the narrow annular space 16, the projection 105 will cause a shadow to fall on slot 103 to actuate the photoelectric relay to stop the cycle of reciprocation, indicating to an operator that a predetermined amount of powder has been compacted in position and that the packing cycle has been completed to allow removal of the insulator and its electrode from the machine. The operator then actuates the foot pedal, as shown in Fig. 6, which controls the fluid pressure flow-

ing to cylinder 74 to move the piston 73 downwardly to allow removal of the insulator assembly from the thimble 43. As shown in Fig. 6, an orifice is preferably positioned in pipe 76 to increase the time required for the piston 73 to move upwardly in its stroke to thereby prevent damage to an insulator by a sudden impact of the holding means 50 on the firing tip 13 of the electrode. The automatic system is preferably provided with a pressure regulator to reduce the pressure actuating the cylinder 96 and with a pair of pressure switches to control the electric circuits so as to operate in a proper timed relation and for purposes of safety.

Referring to Fig. 3, a catching device 110 is shown positioned on the upper end of stirrup 90 by means of a collar 111 fitted about a boss 112. A set screw 113 is provided to extend through an aperture 114, formed in the collar 111, and also to extend through an aperture 115 positioned in the boss 112 so that both the catching device 110 and the ram 86 are firmly held in position with the same set screw. The catching device 110 is in the nature of a cup-shaped device having an inwardly-turned flange 116 to catch loose powder falling from the aperture 85 during reciprocation of the ram 86. A flexible hose 117 is connected to the catching device 110 and is placed in communication with a source of vacuum to draw the loose powder from the catching device 110 so as to prevent the powder from being thrown into the air in the vicinity of the machine. It is clear that the catching device 110 moves upwardly and downwardly in conjunction with the stirrup 90 and the ram member 86.

It is to be understood that the above detailed description of the present invention is intended to disclose an embodiment thereof to those skilled in the art, but that the invention is not to be construed as limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of being practiced and carried out in various ways without departing from the spirit of the invention. The language used in the specification relating to the operation and function of the elements of the invention is employed for purposes of description and not of limitation, and it is not intended to limit the scope of the following claims beyond the requirement of the prior art.

What is claimed:

1. The method of positioning granular compactible material into a holding and sealing body between a pair of members having a narrow annular space therebetween, comprising reciprocating a ram through a loose layer of the granular material, holding the members in predetermined relation adjacent the ram with the annular space opening downwardly to allow the ram to move upwardly into said annular space, carrying granular material into the annular space by a transverse horizontal face on the ram by moving said ram through the layer of loose granular material and into said space with sufficient force to compact the granular material in said space whereby the granular material is retained in position in the annular space between the members.

2. The method of positioning granular compactible material in holding and sealing relation between a pair of members having a narrow annular space therebetween, said annular space being provided with a floor, comprising reciprocating a ram in a vertical direction through a loose layer of the granular material, holding the members in predetermined position within the range of reciprocation of the ram with the annular space opening downwardly, carrying a series of charges of granular material into the annular space to be compacted against the floor of the annular space by means of a flat upper face on the ram upon which the granular material is heaped under the influence of gravity when moving through the layer of loose granular material, and compacting the granular material against the floor of the annular space by reciprocating the ram upwardly into the annular space.

3. The method of positioning granular compactible material in holding and sealing relation between a pair of members having a narrow annular space therebetween, said annular space being provided with a floor, comprising moving a compacting member relative to said pair of members in a vertical direction through a loose layer of the granular material, holding the members in predetermined position with the narrow annular space opening downwardly, carrying a series of charges of granular material into the annular space by a transverse face on the compacting member, and compacting the granular materail against the floor of the annular space by the relative movement between the compacting member and the pair of members.

4. In a machine of the class described, a first holding means for cooperating with an insulator of a spark plug, funnel-like means surrounding the said first holding means having a floor in spaced relation with said holding means, a centering spindle projecting through an aperture in the floor of said funnel-like means to cooperate with the lower end of an electrode mounted in said insulator, tubular ram means adapted to reciprocate on said spindle moving through said aperture in the floor to cooperate with the electrode and insulator adjacent the first holding means, a second holding means longitudinally movable along the axis of the first holding means to cooperate with the other end of the electrode to hold the electrode in cooperative relation with the first holding means, means to move the second holding means into and from cooperative relation with the electrode, and means to reciprocate the ram to and from cooperative relation with the electrode and insulator.

5. In a machine of the class described, a first holding means for cooperating with an insulator of a spark plug, funnel-like means surrounding the said first holding means having a floor in spaced relation with said holding means, said funnel means being adapted to contain compactible powder, a centering spindle projecting through an aperture in the floor of said funnel-like means to cooperate with the lower end of an electrode mounted in said insulator, tubular ram means adapted to reciprocate on said spindle moving through said aperture in the floor to cooperate with the electrode and insulator adjacent the first holding means, a second holding means longitudinally movable along the axis of the spindle to cooperate with the other end of the electrode to hold the electrode in cooperative relation with the spindle, means to move the second holding means into and from cooperative relation with the electrode, and means to reciprocate the ram through the compactible powder into cooperative relation with the electrode and insulator whereby the ram carries small increments of powder into position between the electrode and insulator and compacting the same to form a holding and sealing body.

6. In a machine of the class described, a first holding means for cooperating with an insulator of a spark plug, funnel-like means surrounding the said first holding means having a floor in spaced relation with said holding means, said funnel means being adapted to contain compactible powder, means cooperating with the funnel means to agitate said powder in said funnel-like means, a centering spindle projecting through an aperture in the floor of said funnel-like means to cooperate with the lower end of an electrode mounted in said insulator, tubular ram means adapted to reciprocate on said spindle moving through said aperture in the floor to cooperate with the electrode and insulator adjacent the first holding means, a second holding means longitudinally movable along the axis of the spindle to cooperate with the other end of the electrode to hold the electrode in cooperative relation with the spindle, means to move the second holding means into and from cooperative relation with the electrode, and means to reciprocate the ram through the compactible powder into cooperative relation with the electrode and insulator whereby the ram

carries small increments of powder into position between the electrode and insulator and compacting the same to form a holding and sealing body.

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