

Dec. 9, 1930.

K. A. HAWLEY

1,784,792

APPARATUS FOR MAKING INSULATORS

Filed April 13, 1929

2 Sheets-Sheet 1

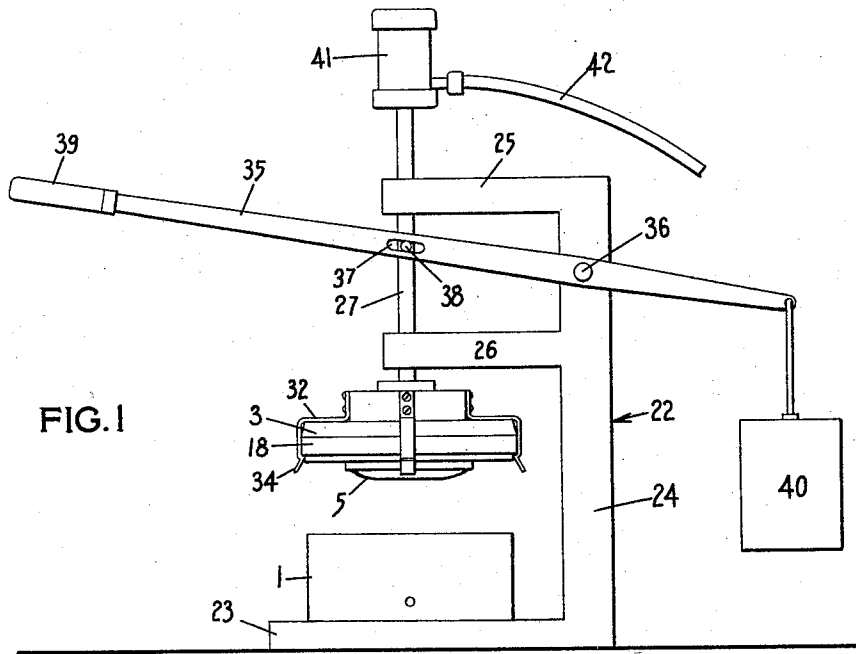


FIG. 1

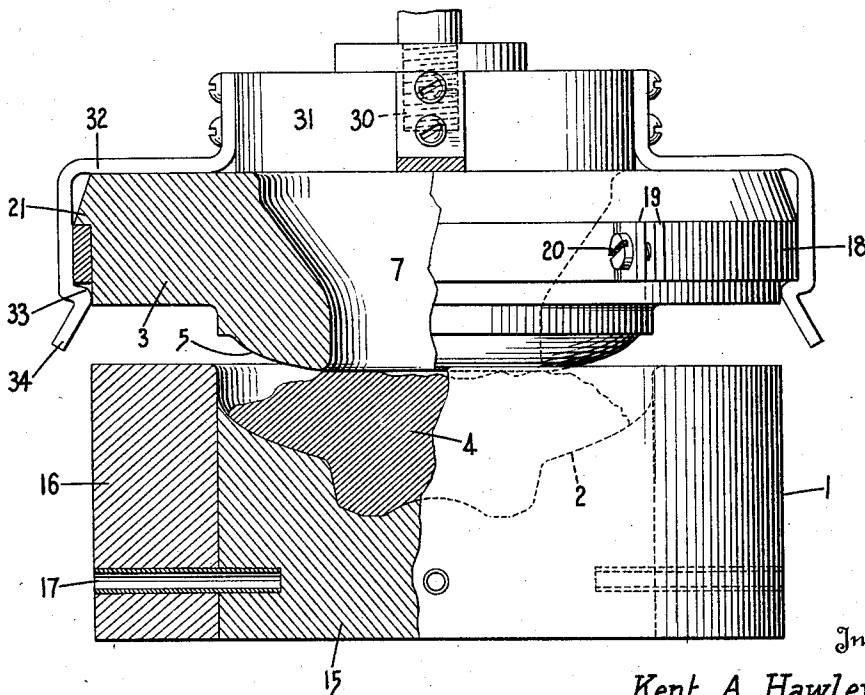


FIG. 2

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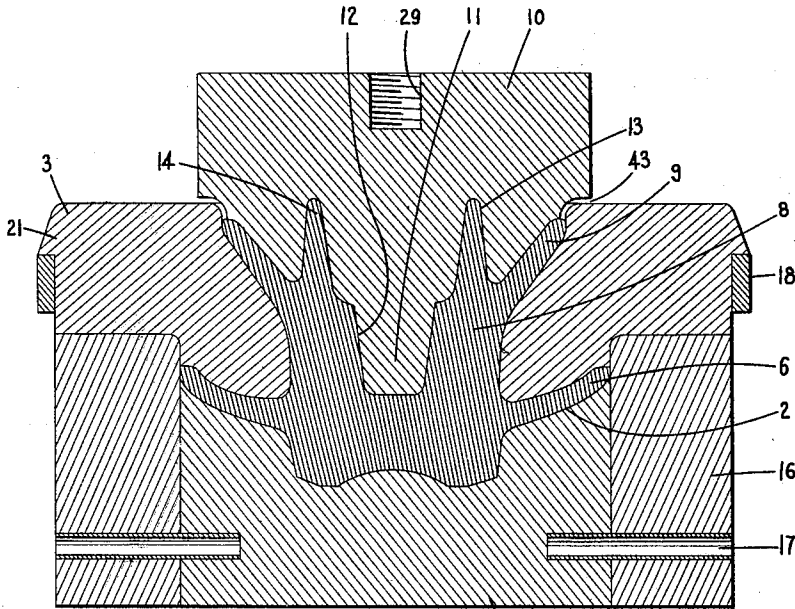
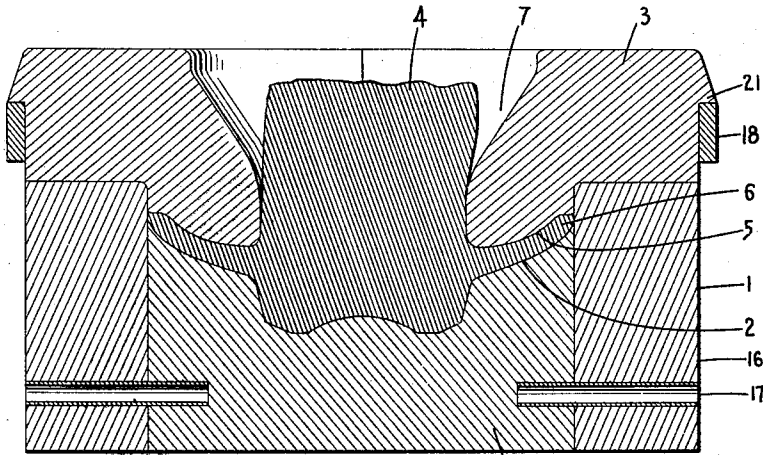
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APPARATUS FOR MAKING INSULATORS

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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APPARATUS FOR MAKING INSULATORS

Application filed April 13, 1929. Serial No. 354,915.

The invention relates to insulators intended for use in connection with high tension transmission lines and has for its general object the provision of a novel method of and means for making an insulator.

It is well known in the art that it is a common practice to make insulators by casting or by plunging, the former method involving the running of plastic material into suitable molds, and the latter involving the employment of dies which are moved relatively in a longitudinal direction and which are also usually rotated at the same time for the purpose of compressing the clay and shaping it. However, under the usual methods there are many limitations as in the casting process certain shapes will not draw from the molds and, as in the plunging system, an analogous condition exists. It has therefore become necessary to make certain types of insulators in sections which are cemented together to produce the finished article.

It is with the above facts in view that I have devised the present invention which has for an important object the provision of a method of and means for making insulators of shapes which could not be made by the known processes, it being a feature that by my method it is easily possible to make a one-piece insulator having the shape and possessing all the advantages but none of the disadvantages of well known types of multi-part insulators intended for use particularly in connection with very high voltages.

Another important object of the invention is the provision of a method in which vibration is utilized during the compression of the clay by the dies as I have discovered that vibrating clay results not only in compacting it but also in breaking up any laminations resulting from the action of the pug mill and other apparatus used in the preparatory stages, the elimination of such laminations resulting in greater homogeneity and overcoming any tendency of the shaped insulator to crack or break during drying and subsequent firing.

In addition to the broad method involved, the invention has for an important object the

provision of a novel apparatus by means of which the method may be carried out, the apparatus or machine being preferably equipped with means for producing the vibration above referred to.

An additional object of the invention is to provide a method which will be easy to carry out, together with a simple arrangement of parts for working upon the clay and forcing it into the desired shape.

To the attainment of the foregoing and other objects and advantages, the invention preferably consists in the details of construction and the arrangement and combination of parts to be hereinafter more fully described and claimed, and illustrated in the accompanying drawings in which:

Figure 1 is a side elevation of an apparatus or machine for carrying out my method,

Figure 2 is a view on a larger scale, parts being in elevation and other parts in section, showing the stationary die and one of the relatively movable dies,

Figure 3 is a cross sectional view through the stationary die and the intermediate movable die showing the condition of the clay after the first step in the operation, and

Figure 4 is a similar view but also showing the second relatively movable or final die and the final condition of the clay.

In its broadest aspect, my invention comprises plunging or compressing a mass of clay between relatively stationary and movable dies shaped to give the proper and desired configuration to the top surface, the underside of the top and a portion of the periphery of the insulator with the surplus clay forced out and projecting upwardly in column form beyond the relatively movable die, and then plunging or compressing this protruding column by means of another relatively movable die for completing the shaping of the periphery and for forming the underside of the lower portion of the insulator, the insulator being formed preferably, though not necessarily, in the inverted position described for the sake of convenience, these operations or method steps being carried out with or without the application of vibration to the clay, though the former is

of great advantage as pointed in the preliminary remarks and therefore preferable.

In the drawings I have shown a convenient machine or apparatus by means of which this broadly described operation or method may be carried out. Referring to the drawings in detail, the numeral 1 designates a relatively stationary mold which may be of any ordinary or preferred mechanical construction and which has a cavity 2 therein of a configuration to give the desired shape to the top of the insulator to be formed. The numeral 3 designates a relatively movable mold adapted to engage and compress a mass of clay 4 placed in the cavity 2, and having a curved undersurface 5 of a configuration to give the proper shape to the outstanding skirt 6 of the insulator, and also formed with a flaring central opening 7. While the opening 7 may be varied in some respects, it is intended to be of such configuration as to give the proper shape to the exterior of the intermediate portion 8 of the body of the insulator, including the top surface of the outermost petticoat 9, though this shaping will not result from the coaction of the molds 1 and 3 alone as the method of making the insulator involves the subsequent use of an additional relatively movable mold 10 which has a projection 11 thereon intended and adapted to enter the clay for forming the usual pin receiving recess 12 therein. In addition to having the projection 11, the mold 10 has its undersurface grooved as at 13 for the entrance of clay thereinto to define the usual petticoat 14 on the insulator. In addition to these two features, the mold 10 is intended to have its underside of such configuration as to give the proper shape to the underside of the petticoat 9.

On account of the peculiar shape of the insulator, that is to say on account of the provision of the downwardly curved skirt 6 and the outwardly flaring petticoat 9, the mold 1 must be formed in sections and it is therefore represented as including a central portion 15 in which the cavity 2 is formed, and a sectional ring or segments 16 surrounding the same and detachably connected therewith as by pins, tubular elements 17 or the like which are fixed with respect either to the central portion 15 or the ring sections or segments and removable with respect either to the ring sections or the central portion, as the case may be. It is likewise obvious that any other suitable means might be used for holding these parts assembled though tubular elements such as those shown are of advantage as use may be made of them for applying suction or pressure to or through the mold 1, and especially the central portion 15 thereof in case the same is formed of porous material such for instance as plaster of Paris, it being well known that the application of suction during molding is advantageous in

removing any entrapped air which might cause inequalities in the clay surface, and that the application of air pressure is likewise advantageous for facilitating the removal of the molded insulator from the mold. For similar reasons, the mold 3 must likewise be made of sections here represented as held together by a metal band 18 which may have terminal ears 19 connected by a bolt 20 or the like. In the present instance the sections of the mold 3 are represented as having an outstanding flange 21 overlying the band 18. The mold 10 is of course simply of solid construction. It might be mentioned in passing that all of the mold members may be of any desired material though a porous structure is preferable for the lowermost or relatively stationary one.

In the carrying out of my method by means of such dies, it is of course necessary that the different die members be assembled in their proper relation and brought into compressing engagement with the clay with considerable force or pressure in order to effect the shaping. While this might be brought about in different ways, I have illustrated a mechanical apparatus or machine for accomplishing the purpose, it being, however, understood that variations from what is shown might be resorted to in several particulars. Referring to Figure 1, it will be noted that I have provided a supporting frame 22 including a base portion 23, an upright 24 and superposed vertically spaced arms 25 and 26, all of which elements are shown without detail. Slidable vertically through the arms 25 and 26 is a rod or shaft 27 constructed at its lower end to carry the mold 3 or the mold 10, the exact method of connection therewith being immaterial though the lower end of the rod 27 may be threaded as shown for engagement within a threaded socket 29 in the mold 10, or within a threaded socket 30 in a disk 31 having means for carrying the mold 3. This means may very easily comprise spring clips 32 secured upon the periphery of the disk 31 and having inwardly directed shoulders 33 engaging beneath the band 18 for retaining purposes, the clips terminating in outwardly directed lips 34 which may be spread apart to release the mold 3 from its holder. The rod or shaft 27 may be moved vertically as by means of a lever 35 pivoted at 36 on the upright 24 and having a slot 37 engaging upon a pin 38 projecting from the rod or shaft 27. The lever may be equipped at one end with a handle 39 and may have its other end carrying a weight 40 for counterbalancing purposes. As it is a very important feature to vibrate the selectively usable relatively movable molds during their movement, I have shown an air hammer or any other desired type of vibration producing device indicated at 41 carried by or otherwise con-

5 nected with the rod or shaft 27. An air hammer is very convenient and such a device may be supplied with the motor fluid through a flexible hose 42 leading from a suitable source.

6 The operation of making an insulator in accordance with my method and by means of the apparatus shown is as follows: The parts of the mold 1 being assembled, that is to say the ring sections or segments 16 having been engaged about the central member 15, this mold is placed on the base portion 23 of the machine in coaxial relation to the rod or shaft 27. Any centering means for determining this position may obviously be used. The disk 31 is then engaged upon the rod or shaft 27, the sections of the mold 3 are assembled and held together by the band 18 and screw or bolt 20, and this assembled mold is then engaged within the clips 32, the shoulders 33 of which will snap into engagement beneath the band 18. The operator then places a billet of clay in the cavity 2 and then grasps the handle 39 and moves the lever 35 downwardly while at the same time whatever valve device is associated with the air line 42 is opened to bring about actuation of the air hammer or vibrator 41. As the lever 35 is brought down the mold 3 will engage the clay billet and compress it within the cavity 2 which will give the proper shape for the top surface of the insulator, it being noted that the insulator is represented as made in inverted position. The convex lower surface 5 of the mold or die 3 will give the proper shape to the under-surface of the skirt 6 which is formed between the central portion 15 of the mold 1 and the mold 3. The surplus clay will be extruded upwardly through the opening 7 and will stand as a column as shown in Figure 3. It should be understood that this compressing action is effected simultaneously with the vibratory effect to obtain the best results though satisfactory results can be obtained even though the vibrating feature is omitted. After this first step the clips 32 are disengaged from the mold or die 3, by the simple expedient of pressing outwardly on the lips 34, and the lever 35 is moved upwardly, carrying with it the disk 31 which should then be removed from the rod or shaft 27. The final die or mold 10 is then engaged upon the rod or shaft 27 and the lever 35 again moved downwardly, preferably while the vibrator is in action, to bring this die 10 into compressing engagement with the clay column which extends within the opening 7 in the die or mold 3. As the die 10 is forced home, the projection 11, groove 13 and other portions of its lower surface will engage the clay and define the petticoats 9 and 14 and also the pin hole or recess 12. The forcing of the clay against the wall of the opening 7 will

give the proper shape to the body 8 of the insulator and the exterior of the petticoat 9. Any surplus clay will of course be extruded at the slight space 43 at the outer edge of the die 10. The lever 35 is again moved upwardly to withdraw the die 10 from the insulator, the band 18 is removed, the ring sections or segments 16 are removed, and the sections of the mold 3 separated and removed whereupon the insulator will be left standing in inverted position upon the central portion 15 of the mold 1. This member 15 carrying the insulator may then be set away in some suitable place while the clay hardens and dries to a certain extent, subsequently to which the insulator is removed, glazed and fired in the usual manner, these subsequent steps not forming part of the present invention.

In actual practice I have discovered that by vibrating the mold or die members during the act of compressingly engaging them with the clay great homogeneity of the clay is brought about, subsequent tests indicating a closer texture, greater compactness and a total absence of laminations which, as is well known, cause cracking and breaking of the insulator sometimes during drying and sometimes during firing. Of course the method is capable of being carried out with the vibrating feature omitted but its advantages are so marked that I prefer to include it as a step in the operation.

From the foregoing description and a study of the drawings it will be apparent that I have thus provided a novel method, and means for carrying it out, of making insulators in one piece but having all the advantages of those of the multi-part type. Joints between sections are eliminated with the benefits derived from the absence of cement which, on account of its hygroscopic nature, expands or swells and frequently causes breakage. Furthermore by my method and means it is possible to construct insulators of such shape as to preclude their formation in the ordinary known manner. It is believed that the advantages will be readily apparent to one skilled in the art without further explanation.

While I have shown and described the preferred method and a certain mechanical apparatus for carrying it out, it should be understood that the disclosure is merely an exemplification of the principles involved and that the right is reserved to make all such changes as will not depart from the spirit of the invention or the scope of the claims hereunto appended.

Having thus described the invention, I claim:

1. In an apparatus of the character described, a sectional mold adapted to have plastic clay placed therein, a sectional die having a central opening and adapted to co-

	operate with said mold for shaping the clay and for extruding a portion thereof through the opening, and a second die adapted to engage said extruded portion for shaping the same.	means for raising and lowering said die with respect to the mold, and means for detachably connecting said die with said raising and lowering means.	
5	2. In an apparatus of the character described, a sectional mold adapted to have plastic clay placed therein, a sectional die having a central opening and adapted to cooperate with said mold for shaping the clay and for extruding a portion thereof through the opening, a second die adapted to engage said extruded portion for shaping the same, and means for vibrating the dies and the clay.	In testimony whereof I affix my signature. KENT A. HAWLEY.	70
10	3. In an apparatus for forming porcelain insulators, a mold adapted to have clay disposed therein and having a cavity shaped to correspond to the top surface of the insulator to be made, a sectional die having a central opening and having an active face adapted to cooperate with said mold for shaping the underside of the top portion thereof and for shaping the exterior of the body of the insulator, said die being movable toward said mold and acting to extrude a portion of the clay through the opening, and a second die adapted to compressingly engage said extruded portion and shaped to define the undersurfaces of the insulator.		75
15	4. In an apparatus of the character described, a sectional mold, a relatively movable sectional die adapted to cooperate therewith and having a central opening, and a second relatively movable die adapted to cooperate with said first named relatively movable die.		80
20	5. In an apparatus of the character described, a supporting structure, a member slidable with respect thereto, a mold supported upon said structure, and selectively usable dies carried by said member for cooperation with said mold and with each other.		85
25	6. In an apparatus of the character described, a supporting structure, a member slidable with respect thereto, a mold supported upon said structure, selectively usable dies carried by said member for cooperation with said mold and with each other, and vibration producing means connected with said member.		90
30	7. In a device of the character described, a support, a sectional mold mounted thereon, a shaft slidably mounted on the support in axial relation to the mold, and a plurality of sequentially operable dies removably carried by said shaft for cooperation with the mold and with each other.		95
35	8. In an apparatus of the character described, a sectional mold including a central portion and a removable peripheral portion, a centrally apertured die adapted to cooperate with said mold and formed of sections, means for holding said sections assembled,		100
40			105
45			110
50			115
55			120
60			125
65			130