UNITED STATES PATENT OFFICE

1,978,627

VIBRATING PLUNGING MACHINE

Minor F. H. Gouverneur, Baltimore, Md., assignor to Locke Insulator Corporation, Baltimore, Md., a corporation of Maryland

Application May 10, 1932, Serial No. 610,451

7 Claims. (Cl. 25—3)

The invention relates to apparatus for forming ceramic ware, particularly insulators, and has for its general object the provision of a novel machine by means of which plastic clay may be "plunged" or shaped by pressure at the same time that rapid vibratory movement is imparted.

It is well known that the clay such as is used in the production of insulators is worked in a press mill from which it is extruded in the form of a column subsequently cut into billets. These billets are mauld and the material is then placed in the form, that is to say the female form member and taken to a plunging machine where a rotary reciprocatory plunger acts upon the clay for effecting shaping thereof. In actual practice it has been found that regardless of how much mauling may be resorted to the clay retains distinct traces of laminations resulting from the action of the blades in the press mill. When the formed insulator dries there may be a tendency to warp and this objection is even more noticeable during firing. As a matter of fact many insulators are destroyed during these stages as the result of internal stresses brought about by the laminated character of the clay mass. I have found that if plastic clay be subjected to rapid vibration its homogeneity and density are not only improved but the laminated character is entirely broken down so that when an insulator is formed from clay previously subjected to vibratory action the tendency toward warping and breaking is greatly reduced.

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 novel machine by means of which vibration is applied to the clay simultaneously with the presting or plunging, there being consequently but one step or operation so that the cost of production will be kept as low as possible while obtaining the great benefits resulting from vibration.

Another object of the invention is to provide a single machine by means of which the above results may be accomplished, the machine being adapted either to apply simply longitudinal pressure upon the clay or a combination of reciprocation and rotation to the male die.

Another object of the invention is to provide a machine of this character in which motor driven means may be provided directly associated with the spindle which carries the male die for imparting vibration thereto irrespective of independent of other means which operates to effect reciprocation of this mechanism as a whole in a direction toward or from the clay.

Another object is to provide a construction of this character which will be simple and inexpensive to construct or assemble, easy to operate and control, positive in action, efficient and durable in service, and a general improvement in the art.

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 front elevation of a machine constructed in accordance with the invention,

Figure 2 is a side elevation thereof,

Figure 3 is an enlarged detail view of the vibrating means,

Figure 4 is a fragmentary view partly in elevation and partly in section showing a modification.

Referring more particularly to the drawings, I have shown the apparatus as comprising a suitable supporting base or stand 10 of any desired detailed construction from which rise spaced vertical guides 11 connected at the top by a cross bar 12 and carrying pulleys 13. Mounted on the cross bar 12 is a pneumatic or hydraulic cylinder 14 having fluid pressure inlet pipes 15 at its end portions so that compressed air or the like may be admitted to either end. Any suitable control valve means, not shown, may be provided for controlling the inlet and outlet of fluid pressure to and from the cylinder.

The numeral 16 designates a carriage provided at its ends with guides 17 slidably upon the uprights 11. The weight of this carriage and the means carried thereby, which means will be later described, is preferably counterbalanced and to effect this I provide flexible members 18 connected with the carriage in some convenient manner, trained over the pulleys 13 and carrying weights 19. The carriage is equipped at its center with a bracket 20 to which is connected at 21 the lower end of a piston rod 22 carrying a piston 23 slidable within the cylinder 14 and adapted to be moved in one direction or the other upon the admission of fluid pressure through one or the other of the pipes 15.

Depending from the carriage 16 and supported therefrom in any suitable manner as for instance by means of the bolts 24 is a platform 25 carrying an electric motor 26 which has its shaft 27 journaled through bearings 28 on the platform and carrying a fly wheel 29. Between the
bearings 28 is a guide 30 within which is mounted for vertical reciprocation a spindle 31 having its lower end adapted to carry a male die 32, the shape and size of which will necessarily depend upon the size of the insulator to be formed and the desired cross sectional configuration of the underside thereof, it being remembered that it is customary to form insulators in inverted position. This die is intended to cooperate with the die 32 which is mounted in any suitable manner upon the bench 10 in vertical coaxial alignment with the spindle 31, the clay to be formed into an insulator being of course initially placed within the die 32 which is shaped to give the desired cross sectional contour to what will be the top surface of the insulator when the same is shaped. It is of course to be understood that the carriage and all the mechanism thus far described is moved vertically by fluid pressure admitted to the selected end of the cylinder 14. However, it is intended that the spindle 31 and die 32 carried thereby have a rapid reciprocatory movement or vibration independent of the movement of the assembly as a whole. To accomplish this I provide a cam 28 on the shaft 27 operating within a sectional species of eccentric strap 35 which is located between the bearings 28 and which is pivotally connected at 36 with the spindle 30. Clearly, when the motor 28 is energized and the shaft 27 thereof rotated, the rotation of the cam 34 within the eccentric strap 35 will cause the latter and consequently the spindle 31 and die 32 to vibrate up and down very rapidly so that this vibratory movement will be applied to the clay when it is compressed between the dies 32 and 33 upon bodily downward movement of the carriage and all the parts carried thereby.

In the act of forming an insulator, it is of course to be understood that the clay is placed within the die 33 and the motor 28 set into operation after which the air pressure is admitted to the upper pipe 15 so as to force the piston 23, piston rod 22, carriage 16 and motor driven vibrating means downward so that the die 32 will come into compressing engagement with the clay which is thus given the desired shape. The vibratory action applied to the clay operates to compact the same and render it homogeneous and entirely free from the laminational tendencies resulting from the action within the mug mill during the step of mechanically kneading the clay as a preparatory step.

In some instances it is preferable to rotate the upper die in addition to reciprocating it with respect to the lower one and it is a simple matter to modify my machine to incorporate this additional feature.

Referring to Figure 4 it will be observed that I have provided motor driven means for imparting rotation to the upper die while it is being reciprocated. In this figure the numeral 37 designates a spindle corresponding to the spindle 31 which may be vibrated in the same manner and this spindle has pivoted thereto at 38 a sectional housing 39 formed with a chamber 40 within which is accommodated a bearing 41 restrained against movement therein and journaled receiving a spindle 42 which extends through a platform or shelf 43 supported beneath the platform 25 and carrying an electric motor 44. The shaft 45 of this motor carries a bevel gear 46 meshing with a bevel gear 47 splined upon the spindle 42. On the underside of this shelf 43 is a bracket 48 having a bearing 49 through which the spindle 42 is rotatable and slidable. A male die 50 corresponding to the previously described die 32 is carried by the lower end of the spindle 42 and coacts with the female member 51 corresponding to the member 32.

It will be observed that the operation of this form of the invention is the same as that of the first described form except for the provision of the motor driven gearing and necessary adjuncts for imparting reciprocatory movement to the die 32 while it is being reciprocated and vibrated by the means above described in connection with Figures 1 to 3. Manifestly a rotating male die will have a greater compacting and smoothing action upon the clay than one that is simply reciprocated, that is to say than one which is simply pressed into place.

From the foregoing description and a study of the drawings it will be apparent that I have thus provided a very simply constructed and consequently inexpensive as well as easily operated and controlled machine by means of which insulators may be formed by the usual plunging process and at the same time gain the benefits of the vibration.

While I have shown and described certain specific details which may be said to constitute the preferred embodiment of the invention it should be understood that the disclosure is mostly an exemplification of the principles involved and that the right is reserved to make such changes in the details and arrangement and combination of parts 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 insulator forming machine, a stationary support, a carriage mounted for reciprocatory movement thereon, mechanical means for moving the carriage, a spindle supported by the carriage and carrying a die, means independent of said mechanical means for vibrating said spindle, and separate means for rotating the spindle.

2. In an insulator forming machine, a stationary support, a carriage mounted for reciprocatory movement thereon, mechanical means for moving the carriage, a spindle supported by the carriage and carrying a die, mechanical means independent of said first named means for vibrating said spindle longitudinally, and other mechanical means for rotating the spindle.

3. An insulator forming machine comprising a stationary support provided with guides, a carriage mounted for vertical movement along said guides, means for moving the carriage vertically, a spindle supported beneath the carriage and carrying a die, mechanical means for positively vibrating the spindle in an axial direction, and other means for rotating the spindle, all of said means being mechanically operable at the same time.

4. In an insulator forming machine, a stationary support, upstanding guides thereon, a carriage vertically slidable along said guides, means connected with the carriage for moving the same up and down, a support mounted beneath the carriage, a spindle slidable through said support and carrying a die, and motor driven means on said support for vibrating said spindle axially.

5. An insulator forming machine comprising a stationary structure, spaced upright guides thereon, a carriage slidable vertically along said guides and equipped with counterbalancing means, means for moving the carriage up and down, a
support depending from the carriage, a bearing structure on said support, a motor on said support having a shaft journaled through said bearing structure, a spindle vertically slidable through said support and carrying a die adapted to cooperate with a die on said supporting structure, a cam on said shaft, and an eccentric strap surrounding said cam and pivotally connected with said spindle whereby the latter may be vibrated in the direction of its axis.

6. In an insulator forming machine, a stationary supporting structure, spaced upright guides thereon, a carriage slidable along the guides, means for moving the carriage vertically, a support depending from the carriage, a spindle extending through said support, means on said support for vibrating said spindle axially, a second spindle mounted beneath and in line with said first named spindle and carrying a die adapted to cooperate with a die mounted on said supporting structure, and motor driven means for rotating said second named spindle.

7. In an insulator forming machine, a stationary support having guides, a carriage slidable along the guides, mechanical means for moving the carriage along the guides, a spindle mounted in the carriage and carrying a die, means for vibrating said spindle, and separate means mounted on the carriage for rotating said spindle simultaneously with vibratory movement thereof and sliding movement of the carriage.

MINOR F. H. GOVERNEUR.