Feb. 22, 1955 J. M. PINNEY 2,702,435

CERAMIC WARE DRIER

Filed Jan. 13, 1954

Fig. 1

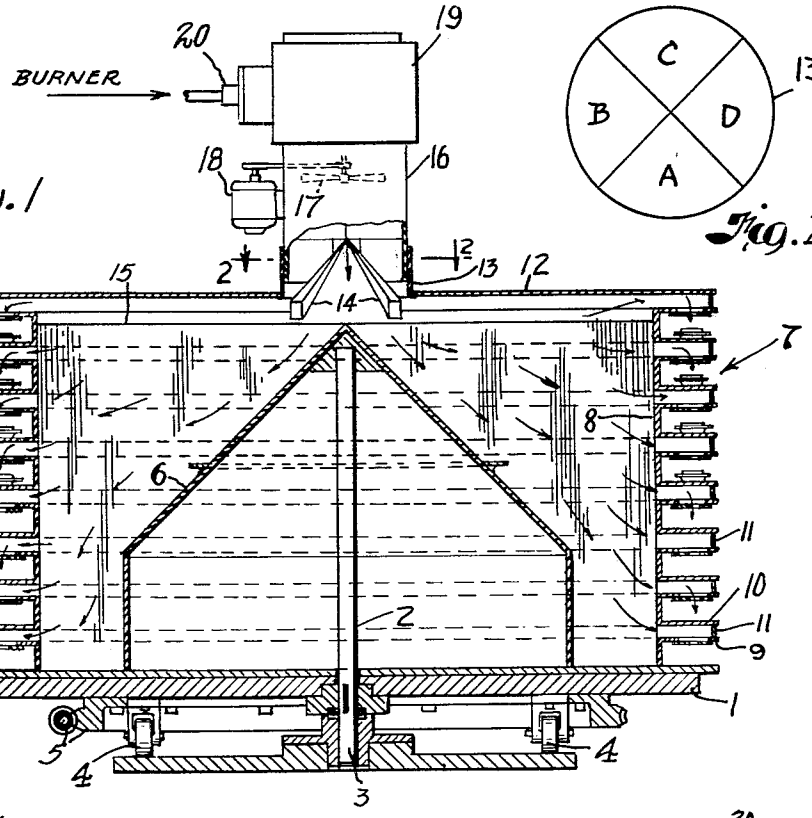
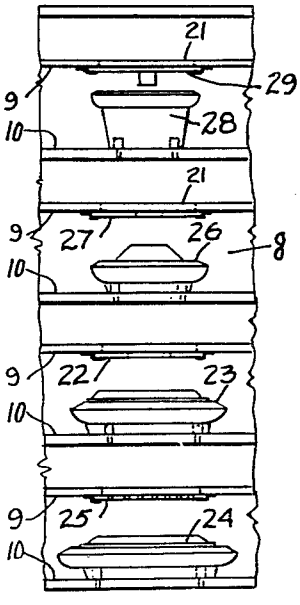


Fig. 2

Fig. 4



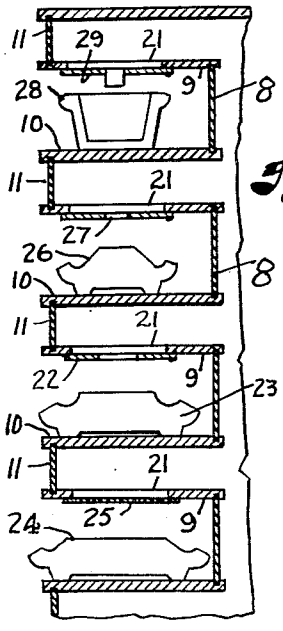


Fig. 3

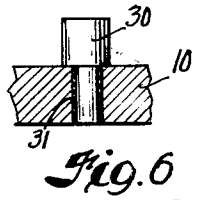


Fig. 6

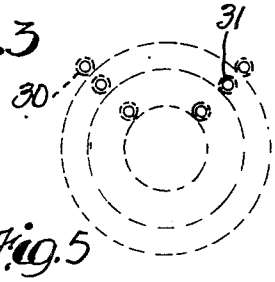


Fig. 5

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CERAMIC WARE DRIER

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4 Claims. (Cl. 34—105)

This invention relates to apparatus for the drying of ceramic ware.

As is well known there are many classes of ceramic ware such as domestic china, pottery, etc. in which the cross sectional area of the ware is non-uniform in that there are local areas which are much thicker and require longer drying periods or different drying conditions than do other sections. The fact that the work is supported on a mold is responsible for the more rapid drying of the work at its periphery than at the center. Usually the center of the work is thicker or heavier or has thicker or heavier local areas than the marginal or rim portions. These factors all tend to an unbalance in the uniform drying rate of the ware.

When conditions such as those enumerated are encountered the only practical solution up to the present has been to dry the ware at an extremely slow rate so that there is never any great differential between the relative dryness of different portions of the work. This has necessitated the storing of the ware in drying ovens for long periods of time under extremely accurately controlled conditions and even then with only a fair degree of success so that great expense has been involved in connection with this phase of ceramic industry.

It is a principal object of the present invention to provide an apparatus whereby this drying procedure may be performed at a considerably more rapid rate than has heretofore been possible and also with a much lower percentage of spoiled ware than has heretofore been possible.

It is a further and more particular object of my invention to provide an apparatus of the type described which may be readily accommodated to the drying of many different forms of ceramic ware so that it can accept mixed batches of widely-different types of green ware with only a minimum of adjustment necessary to accommodate such different types.

Other objects of the invention will appear as the description proceeds.

To the accomplishment of the foregoing and related ends, the invention, then comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawing setting forth in detail one illustrative embodiment of the invention, this being indicative, however, of but one of the various ways in which the principle of the invention may be employed.

In said annexed drawing:

Fig. 1 is a transverse sectional view taken on a vertical plane of one form of apparatus embodying the principles of my invention;

Fig. 2 is a transverse sectional view of a portion of the apparatus illustrated in Fig. 1 taken on a plane substantially indicated by the line 2—2;

Fig. 3 is a fragmentary sectional view of a portion of the apparatus illustrated in Fig. 1 showing in position therein various forms of ware such as may be accommodated by my apparatus in the drying thereof;

Fig. 4 is a side elevational view of apparatus such as has been illustrated in section in Fig. 3;

Fig. 5 is a schematic plan view of a form of apparatus constructed in accordance with my invention indicating the location therein of the means provided for properly orienting in the apparatus the work to be dried; and

Fig. 6 is a fragmentary sectional view of a portion of my apparatus showing particularly the means employed for properly orienting the work therein.

Referring now more particularly to the drawing, and more especially to Fig. 1, it should be pointed out at the outset that the apparatus illustrated in this figure embodying my invention is essentially a cylindrical housing which has on its peripheral exterior a plurality of shelves or balconies on which the ceramic ware to be dried is supported. Each of these balconies is hollow and is in communication with the interior of the housing to which the heated air is supplied by suitable means so that it may pass into these balconies and be delivered through an opening in the lower face thereof onto the work to be dried which is supported on the next lower balcony.

Accordingly, the circular base 1 which is pivotally or rotatably mounted about a vertical shaft 2 in a bearing 3 is rotatably supported on a plurality of circumferentially spaced wheels 4 and adapted to be driven by hand or preferably at uniform speed by means of a worm and gear generally indicated at 5.

Mounted centrally on the base 1 is a coniform baffle generally indicated at 6, such baffle serving the dual purpose of effecting a proper distribution of the air flow within the housing and also providing a means for the support of the housing on the shaft 2.

Mounted on the base 1 is a circular housing generally indicated at 7 which consists of a plurality of inside walls 8 and a plurality of horizontal walls 9 and 10. The walls 9 serving as the lower surface of the balconies as aforesaid and the walls 10 serving as the upper surface thereon.

The members 9 and 10 are closed in at their outer edges by means of vertical walls 11 so that these lateral walls together with the base 1 and a lid or cover 12 completely enclose the housing so that as drying air is introduced centrally at the top thereof such air is forced to find points of exit which are provided at spaced points in the lower elements 9 of the several balconies.

Mounted centrally on the cover 12 of the housing is a dome generally indicated at 13, which as indicated diagrammatically in Fig. 2, is provided with diametrically extending partitions which divide the dome into segments A, B, C and D. By means of baffles generally indicated at 14 attached to the lower ends of the partitions which divide or separate segments just described, the amount of air which is delivered to each segmental portion of the housing itself may be accurately controlled. In this connection it should be pointed out also that the housing itself is provided with similar diametrically arranged partitions which extend the elevation indicated by the line 15 so that the air which enters each segmental portion A, B, C or D is segregated in the housing proper and caused to flow to a particular group of egress orifices arranged in the under sides of the balconies associated with that segment.

Supported by suitable brackets, not shown, in telescopic engagement with the dome 13 is a cylindrical conduit 16 in which is housed a fan 17 driven by a motor 18 for the purpose of causing a flow of air to move downwardly into the housing 7.

Mounted on top of the member 16 is a burner chamber generally indicated at 19 into which a hydrocarbon or like burner 20 is adapted to project a flame preferably tangentially of the burner housing for the purpose of supplying thereto heated air which may then be drawn downwardly by the fan 17 and introduced to the housing 7.

In Figs. 3 and 4 there are illustrated various forms of ceramic ware adapted to be dried by the apparatus of this invention. Each of the work pieces here illustrated is, of course, in accordance with common practice, supported in a suitable mold for the purpose of holding it to desired shape until it is thoroughly dried and thus becomes self-supporting. The lower wall of each of the balconies, in a position directly above where the work is supported on the next lower balcony, is provided with an air outlet opening generally indicated at 21. These openings are sufficiently large to more than accommodate the amount of air required to be directed to each work piece. Supported by suitable brackets over each of these outlet openings 21 is a nozzle plate 22. These nozzle plates may take various forms. For example, the form required for the drying of a work piece such as 23 may be a single round opening directly over the center of the work piece,

whereas when drying a different type of ceramic article such as **24**, which is relatively flat and wider than the work piece **23** the baffle plate **25** may be in the form of a plate having a plurality of uniformly-distributed openings over its entire area so that the drying air is distributed substantially uniformly over the entire section of the work to be dried. When, for instance, a ceramic body having a large central mass such as **26** is to be dried, then the drying air opening in the baffle plate such as **27** may be smaller and thus direct a restricted high velocity stream toward the center of the work piece so that the thick central section will be caused to dry at a rate which is substantially uniform with the rate at which the outer thinner sections of the same work piece are caused to dry. When a hollow object such as **28** is to be dried, then the baffle plate **29** placed over the orifice over such work piece may have a directing nozzle associated therewith so as to assure the delivery downwardly into the bottom of the work piece of a directed high velocity stream of drying air so as to again insure uniform drying of the entire cross section of the work piece.

The molds or forms on which the wet green ware is supported during the drying operation should have formed on the lower surface thereof ridges or openings for the reception of aligning pins such as **30** shown in Fig. 6 mounted in a suitable opening provided for its reception in the horizontal wall **10** of the balcony. As diagrammatically illustrated in Fig. 5, the upper surface of each of the balconies may be provided with a plurality of openings **31** for the reception of pins **30** such openings being arranged on circles of different diameter to accommodate the ridges or openings on the bottoms of the molds or forms on which the work is supported. For instance in Fig. 5 when the apparatus is designed for the drying of chinaware, the inner circle may have a radius of 2⅝ inches and thus accommodate 4 inch cups and saucers, the next or intermediate diameter may be 3¾ inches radius to accommodate 6 inch plates and cups and the outer circle of openings for the reception of pins **30** may be 4⅜ inch radius for the accommodation of 7 and 8 inch dinner plates. By the provision of such a series of pins or openings for the reception of pins underneath each of the air egress openings on the lower face of each balcony, there is provided a means for positively orienting the work piece with respect to the center of the air jet delivered thereto. This again insures that there will be proper distribution of the air with respect to the work piece so as to again insure uniform drying of the ware over its entire area.

The apparatus described may be formed of any suitable material, it being noted that because of the fact that there is a large amount of moisture present and it is desirable to keep the construction to a minimum weight, it may be formed of a suitable wood such as used for purposes of this kind. The various air distributing plates which are mounted over the air egress orifices **21** have been made in a commercial machine of a material such as pressed wood or the like, this material being selected because of its ready workability so that whenever a new type of ware is formed it is relatively easy to form a nozzle which will provide the type of air stream best suited for that purpose. It will be noted that these air distributing nozzles or plates may be removably secured in any suitable fashion to the underside of the plates **9** so as to make their replacement relatively simple when a different kind of work is to be dried.

Other forms may be employed embodying the features of my invention instead of the one here explained, change being made in the form or construction, provided the elements stated by any of the following claims or the equivalent of such stated elements be employed.

I therefore particularly point out and distinctly claim as my invention:

1. A drier for ceramic ware comprising: (*a*) a substantially cylindrical housing; (*b*) means for rotating said housing about its vertical central axis; (*c*) a plurality of vertically spaced horizontally extending peripheral enlargements on said housing, in air-exchange communication with the interior of said housing; that portion of each such enlargement which overlies another enlargement, being provided with spaced air-discharge openings and that portion of each such enlargement which underlies such an air discharge opening being adapted to support ware to be dried; and (*d*) a plurality of flat plates removably supported over said spaced discharge openings having apertures therethrough of different diameters adapted to discharge air from said openings on ware of different sizes and configurations.

2. A drier for ceramic ware comprising: (*a*) a substantially cylindrical housing; (*b*) a coniform baffle centrally of said housing with its apex pointed upwardly in said housing; (*c*) means for introducing a stream of drying air to said housing centrally at the top thereof; (*d*) means for rotating said housing about its vertical central axis; (*e*) a plurality of vertically spaced horizontally extending peripheral enlargements on said housing, in air-exchange communication with the interior of said baffle; that portion of each such enlargement which overlies another enlargement, being provided with spaced air-discharge openings and that portion of each such enlargement which underlies such an air discharge opening being adapted to support ware to be dried; and (*f*) means removably supported over said air-discharge openings for modifying the character of the air-stream delivered thereby.

3. A drier for ceramic ware comprising: (*a*) a substantially cylindrical housing; (*b*) a coniform baffle centrally of said housing with its apex pointed upwardly in said housing; (*c*) radial partitions dividing into segments the interior of said housing above said baffle; (*d*) means for introducing a stream of drying air to said housing centrally at the top thereof; (*e*) means for rotating said housing about its vertical central axis; (*f*) a plurality of vertically spaced horizontally extending peripheral enlargements on said housing, in air-exchange communication with the interior of said housing above said baffle; that portion of each such enlargement which overlies another enlargement, being provided with spaced air-discharge openings and that portion of each such enlargement which underlies such an air discharge opening being adapted to support ware to be dried; and (*h*) means removably supported over said air-discharge openings for modifying the character of the air-stream delivered thereby.

4. A drier for ceramic ware comprising: (*a*) a substantially cylindrical housing; (*b*) a coniform baffle centrally of said housing with its apex pointed upwardly in said housing; (*c*) radial partitions dividing into segments the interior of said housing above said baffle; (*d*) means for introducing a stream of drying air to said housing centrally at the top thereof; (*e*) means for rotating said housing about its vertical central axis; (*f*) a plurality of vertically spaced horizontally extending peripheral enlargements on said housing, in air-exchange communication with the interior of said housing above said baffle; that portion of each such enlargement which overlies another enlargement, being provided with spaced air-discharge openings and that portion of each such enlargement which underlies such an air discharge opening being adapted to support ware to be dried; (*g*) means on said ware supporting portion of said enlargements for orienting the ware placed thereon; and (*h*) means removably supported over said air-discharge openings for modifying the character of the air-stream delivered thereby.

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