

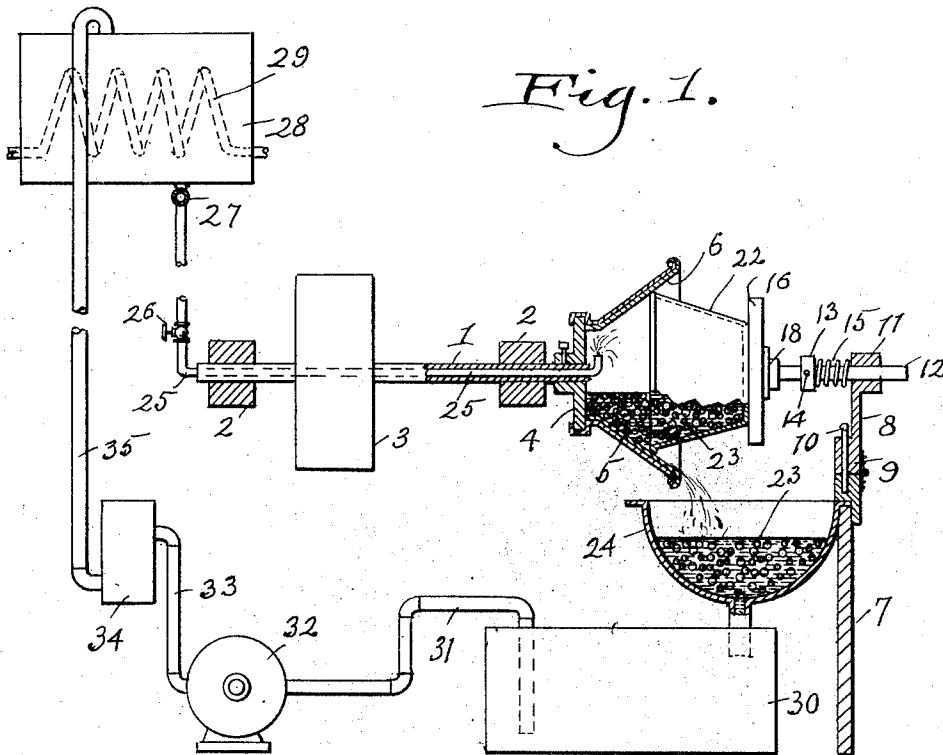
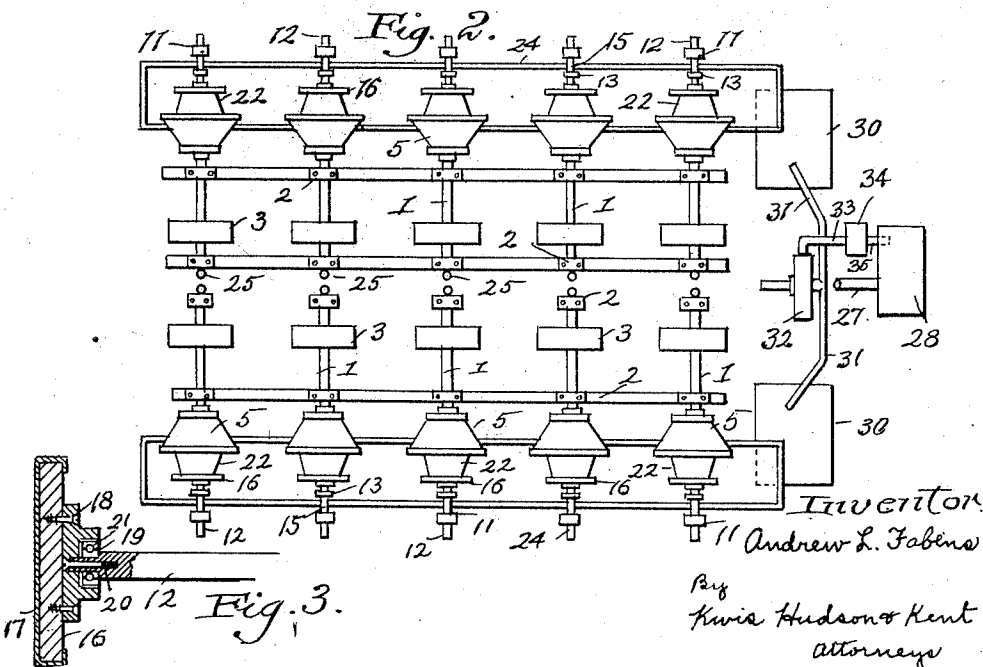
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METHOD AND APPARATUS FOR FINISHING SURFACES OF HOLLOW METAL WARE

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METHOD AND APPARATUS FOR FINISHING SURFACES OF HOLLOW METAL WARE.

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This invention relates to a method and apparatus for finishing surfaces of articles of hollow metal ware, particularly cooking utensils, to produce a smooth and hardened surface.

The present invention is an improvement over the method disclosed in my co-pending application Serial No. 40,123, filed June 27, 1925, and has among its objects to provide a method by which the length of time necessary for the finishing operation is shortened and by which a more perfect polish is imparted to the surfaces treated.

In a general way the method comprises the mounting of a hollow ware article on a suitable support in such a manner that it may be continuously rotated and to confine in contact with the surface or surfaces to be finished, a mass of steel balls of different sizes which, when the article is rotated, tumble and roll upon the surface against which the balls bear acting to condense and harden the surface against which the balls bear and at the same time produce a uniformly bright and attractive polished surface. In addition a stream of hot cleansing liquid is passed through the mass of balls throughout the entire polishing operation in order to wash the surface thoroughly clean and to carry away any particles of scale or foreign matter so that a highly polished surface may be produced in a minimum time by the action of the balls rolling upon said surface.

The use of small balls in combination with large ones has the effect of separating the larger balls so that they cannot form a regular arrangement owing to the fact that the balls would tend to remain in a regular formation and produce lines or grooves.

The cleansing liquid is preferably a suitable solution of a burnishing soap and the article is rotated at a relatively high speed, the finishing operation being performed in approximately ten minutes.

A further object of the invention is to provide apparatus by means of which the method may be performed effectively and at a small cost for labor and material.

A further object is to provide devices for holding and rotating the hollow ware articles which are so designed as to automatically accommodate articles of various sizes.

A further object is to provide means for

continuously delivering a clean cleansing liquid to the interior of each hollow ware article being treated and to reclaim and filter the liquid after it has been passed through the balls acting upon the surface of an article.

A further object is to provide means by which the articles may be securely held and rapidly rotated without danger of distorting or marring the articles.

A further object is to provide holding means such that the removal and replacement of holders is facilitated.

With the above and other objects in view the invention may be said to comprise the method and apparatus as illustrated in the accompanying drawings hereinafter described and particularly set forth in the appended claims together with such variations and modifications thereof as will be apparent to one skilled in the art to which the invention appertains.

Reference should be had to the accompanying drawings forming a part of this specification in which Fig. 1 is a side elevation partially in section showing one of the article rotating and holding devices, and also showing a part of the circulatory system by which the cleaning liquid is supplied to the articles being treated; Fig. 2 is a top plan view showing a series of article rotating devices, the troughs for collecting cleansing liquid dripping from the articles and the means for circulating the cleansing liquid; Fig. 3 is a sectional detail view showing the mounting of the retractible clamping chuck on its shaft.

Referring to the accompanying drawings it will be seen by reference to Fig. 2 that the article holding and rotating devices are arranged in rows, the rotation being imparted to each holder through a hollow horizontal shaft 1 journaled in fixed bearings 2 and driven by suitable driving pulleys 3 fixed thereto and operated by a suitable belt from a power shaft. The shafts 1 are arranged side by side in parallel relation and each is provided with a clamping chuck in its outer end, each of these chucks consisting of a suitable metal disk 4 which is fixed to the outer end of a shaft 1 and a conical outwardly flaring sheet metal clamping member 5 which has a rubber facing 6 upon its interior surface.

Means is provided for releasably clamping

the hollow ware articles with the open tops thereof engaged upon the interior of the conical engaging members 5 in such a manner that the hollow ware articles are caused to rotate with the shaft 1. The releasable clamping mechanism for each of the chucks on the shafts 1 is mounted upon a fixed support 7 which is spaced outwardly from the outer end of the shaft, the clamping means being carried by a bracket 8 pivotally connected by means of a hinge 9 to the upper end of the support 7. The bracket 8 is adapted to be supported in upright position upon the top of the support 7, the hinge 9 being connected to the outer sides of the bracket and support, and when in this upright position the bracket may be releasably locked by means of a pin 10 which is slidably supported in the base of the bracket 8 and is adapted to enter a recess or socket in the upper end of the support 7. At its upper end the bracket 8 has a bearing portion 11 in which is slidably mounted a horizontal shaft 12 which is in axial alignment with the adjacent shaft 1. The shaft 12 has a collar 13 adjustably secured thereto by means of a set screw 14, and a coil spring 15 is interposed between the collar 13 and the bearing portion 11 of the bracket, the spring 15 acting to yieldably press the shaft 12 towards the shaft 1. The shaft 12 at its inner end has rotatably mounted thereon a chuck which co-operates with the chuck on the outer end of the shaft 1, and this chuck consists of a flat wooden disk 16 which is faced on its inner side with a suitable piece of fabric 17. For rotatably securing the disk 16 to the shaft 12 there is a metal bearing member 18 attached to the rear face of the disk and the shaft 12 is provided with a reduced end portion 19 which extends into the bearing member 18. The bearing member is retained on the reduced portion 19 of the shaft by means of a screw 20 which has its head lying within a recess in the inner face of the bearing member and is screwed into a threaded opening extending axially into the reduced end of the shaft, a suitable ball bearing 21 being mounted in the bearing member 18 and held in place by the shoulder at the end of the reduced portion 19. The chuck 16 is thus rotatable upon the shaft 12 and the pressure exerted by the spring 15 holds the chuck 16 against the bottom of a hollow ware article 22 which is clamped between the chuck 16 and the chuck carried by the outer end of the shaft 1.

The hollow ware article to be treated is first filled with steel balls 23 of various sizes and then placed with the open end thereof in engagement with the interior of the conical chuck member 5, the balls 23 being supported partially by the hollow ware article 22 and partially by the conical chuck member 5. Extending beneath each row of ro-

tating holders there is a trough 24 which is preferably partially filled with steel balls so that the operator can scoop up the balls from the trough 24 in the hollow ware article before placing the same in the holder. The hollow ware article is clamped in place by swinging the bracket 8 to vertical position which brings the disk 16 into engagement with the bottom of the hollow ware article, the bracket 8 being locked in upright position by the pin 10 and the coil spring 15 exerting sufficient pressure against the disk 16 to hold the article in place and cause it to rotate with the shaft 1. In removing the article from the holder it is necessary only to remove the pin 10 and swing the disk 16 out of the way. A second hollow ware article may be placed in the trough 24 immediately beneath the conical chuck member 5 to catch the balls discharged therefrom upon the release of the article clamped between the chucks.

The rapid rotation of the hollow ware article with the balls upon the interior thereof causes the irregularities upon the inner surface to be rolled down compacting the metal of such surface and imparting a smooth finish.

In order to obtain an effective hardening and polishing action, it is essential that both the balls and the interior surface of the articles be perfectly clean and free from any oily matter. To keep the balls and the surface of the articles being treated perfectly clean and to carry away any particles of foreign matter, means is provided for maintaining a flow of clean hot cleansing liquid through each mass of balls during the finishing operation. This cleansing liquid is fed into the interiors of the chuck members 5 by means of pipes 25 each provided with a suitable regulating valve 26 and connecting with a pipe line 27 which receives the cleansing liquid from an elevated tank 28 which may be heated by suitable means such as steam coils 29. The cleaning liquid within the chucks 5 and the interiors of the hollow ware articles by reason of the pressure of the liquid and the centrifugal force due to rapid rotation, escapes between the edges of the articles and the face of the chuck, the spring 15 yielding sufficiently to permit a substantially uniform flow of liquid during the rotation of the articles. The cleansing liquid escaping from the interiors of the hollow ware articles drips from the mass of balls within the articles into the troughs 24 and these troughs drain into suitable receptacles 30 which are connected by pipes 31 with a suitable pump 32 which delivers through a pipe 33 to a filter 34 forcing the liquid through the filter and through a pipe 35 to the tank 28. The cleansing liquid employed is thus circulated in an endless system and reclaimed after passing through

the balls acting upon the hollow war articles. By passing the liquid through the filter the supply of liquid in the tank 28 is kept clean and it is only necessary to supply additional
 5 water and soap to replace the small amounts lost in the operation. The stream of hot cleansing solution keeps the surface being acted upon and the balls acting upon said surface perfectly clean so that the compact-
 10 ing and polishing action of the balls is facilitated shortening the time required for imparting the finish to the surface and producing a surface having a better polish.

Having thus described my invention, I
 15 claim:

1. In apparatus of the character described, a closure member, means for clamping a hollow ware article containing a mass of relatively hard balls against said closure
 20 member with the open end of the article against said closure member, means for rotating said closure member and the hollow ware article clamped thereto and means for directing a stream of a cleansing liquid to
 25 the interior of said article.

2. In apparatus of the character described, means for supporting and rotating an article of hollow metal ware, including a closure member for the open end of said article
 30 for confining a mass of relatively hard balls within the same, and means for maintaining a flow of a cleansing liquid through said mass of balls.

3. In apparatus of the character described, a hollow shaft, means for driving said shaft,
 35 a chuck fixed to said shaft at one end thereof, said chuck having an outwardly flaring peripheral portion adapted to receive the open end of an article of hollow metal ware and to cooperate with said article to retain
 40 a mass of relatively hard balls in contact with the interior of said article, means for clamping said article to said chuck, and means for delivering a stream of cleansing liquid under pressure to the interior of said
 45 hollow article.

4. In apparatus of the character described, a series of rotatable supports, each support
 50 having means for clamping an article of hollow metal ware and for closing the open end of the article to retain a mass of balls within the same, means for rotating said supports, a pipe line having branch connections for delivering a stream of cleansing
 55 liquid to the interior of each article, a trough extending beneath said supports for collecting cleansing fluid dripping from the articles, and means for returning the cleansing fluid from the trough to said pipe line, and
 60 for heating the fluid.

5. In apparatus of the character described, a series of rotatable supports, each support having means for clamping an article of

hollow metal ware and for closing the open
 end of the article to retain a mass of balls
 65 within the same, means for rotating said supports, a pipe line having branch connections for delivering a stream of cleansing liquid to the interior of each article, a trough
 70 extending beneath said supports for collecting cleansing fluid dripping from the articles, a filter, and means for collecting the liquid from said trough, forcing the liquid through said filter, heating the liquid, and
 75 returning the same to said pipe line.

6. In apparatus of the character described, a shaft, a conical outwardly flaring chuck non-rotatably secured to the end of said shaft and adapted to receive the open top of an
 article of hollow metal ware, means for driv-
 80 ing said shaft, a fixed support beyond the end of said shaft, a second shaft mounted in said support in axial alignment with the first shaft, a chuck rotatably mounted on said second shaft and adapted to engage the
 85 bottom of an article of hollow metal ware, and means for yieldably pressing one of said chucks toward the other to clamp said article.

7. In apparatus of the character described,
 90 a driven shaft, a conical outwardly flaring chuck fixed to one end of said shaft, said chuck having its interior surface faced with rubber, a second shaft supported in axial alignment with the first, a chuck rotatably
 95 mounted upon the inner end of said second shaft, said second chuck being in the form of a flat disk faced with fabric, and means for yieldingly pressing said second chuck toward the first.
 100

8. In apparatus of the character described, a hollow driven shaft, a conical outwardly flaring chuck fixed to an end of the driven shaft, means for clamping an article of hollow metal ware to said chuck with the open
 105 top thereof engaging the same, and a pipe extending through said hollow shaft for delivering a cleansing liquid to the interior of an article clamped to the chuck.

9. In apparatus of the character described,
 110 a driven shaft, a conical outwardly flaring chuck fixed to an end of the driven shaft, and means for releasably clamping an article of hollow ware to said chuck with the open end thereof engaging the same comprising a
 115 rotatable chuck engageable with the bottom of the article, a pivotally mounted support for said chuck, means for releasably securing said support in operative position, and a spring interposed between the second chuck
 120 and its support and acting to yieldingly press said second chuck toward the first when said support is in operative position.

In testimony whereof, I hereunto affix my signature.

ANDREW L. FABENS.