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J. W. SMITH

LAPPING MACHINE

Filed April 3, 1923

Fig. 1.

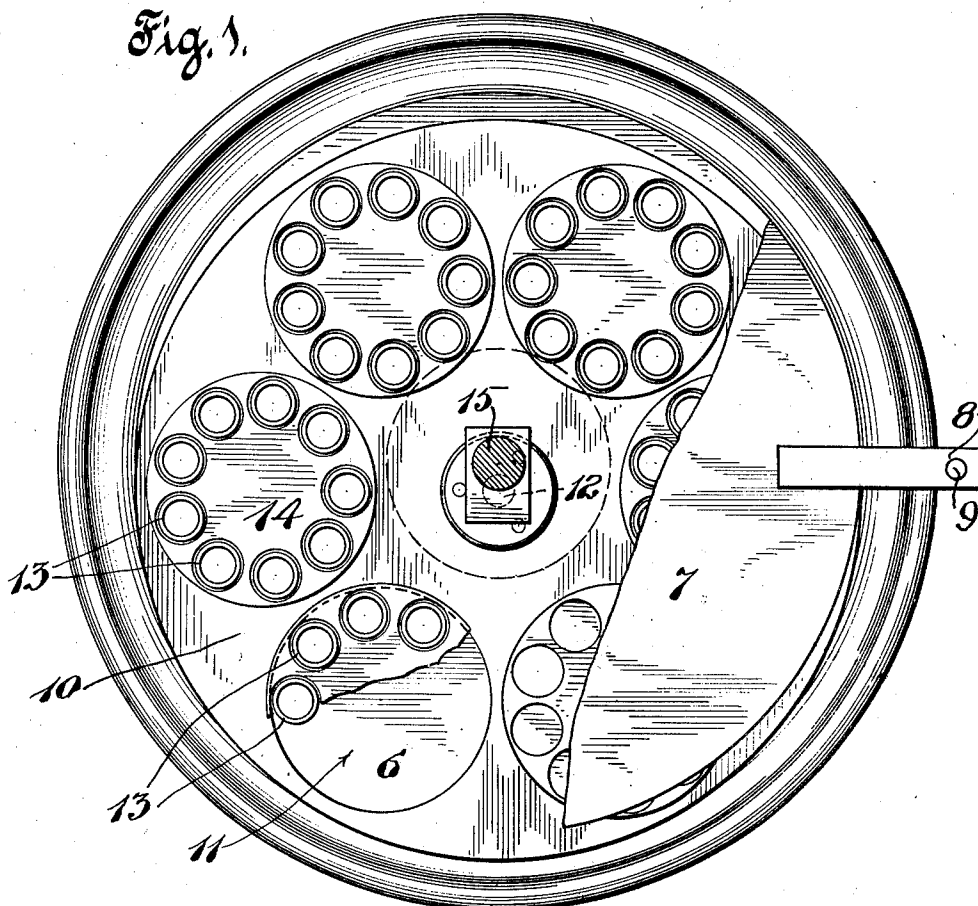
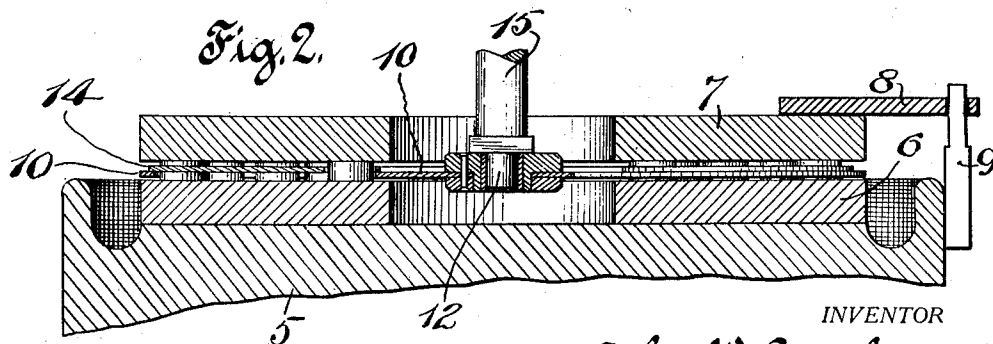


Fig. 2.



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LAPPING MACHINE.

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To all whom it may concern:

Be it known that I, JOHN W. SMITH, a citizen of the United States of America, residing at New Britain, Connecticut, have invented a new and useful Lapping Machine, of which the following is a specification.

My invention relates to a lapping machine.

It is the principal object of the invention to provide a lapping machine wherein many articles may be lapped at one time, each of the articles being subjected to substantially the same lapping treatment as every other article during the lapping operation.

Other objects will be apparent as the specification proceeds.

Briefly, a preferred form of the invention may be described as follows:

Flat lapping discs, open at the center, are suitably mounted, and between the discs is positioned a main work carrier plate having openings therein, each for receiving a plurality of articles. A secondary work carrier plate is provided for each opening in the main work carrier, and these secondary plates are preferably provided with pockets or apertures, each for receiving an article to be lapped. Provision is made for moving the lapping discs and work carriers relatively to each other so as to cause the articles to be properly lapped.

In the drawings, which show, for illustrative purposes only, a preferred form of the invention:

Fig. 1 is a top plan view of a lapping machine embodying features of my invention, portions being broken away.

Fig. 2 is a vertical sectional view through the machine shown in Fig. 1, parts being shown in elevation in order to better illustrate the invention.

In said drawings, 5 indicates a suitable base or foundation for the lapping machine, upon which is mounted the lower lapping disc 6. An opposed upper lapping disc 7 of substantially the same form as the lower disc is provided. These discs 6 and 7 are preferably of annular form so that articles, during the lapping operation, may overlap both the inner and outer edges of the same, so that the wear on the surfaces will be uniform throughout. The laps 6 and 7 in the preferred form are non-rotatable relatively to the base or foundation, but the upper lap

7, while being prevented from rotation by any suitable means, such as one or more stops 8 and pins 9, may be raised or separated from the lower lap 6 by any suitable means.

A main work carrier plate 10 is interposed between the two laps 6-7. In the form shown this carrier is of relatively thin metal, such as steel, and is provided with a plurality of relatively large openings, such as 11. A crank 12 co-operates with the work carrier 10 and is preferably detachably connected thereto at a point substantially at the center thereof, and serves to drive the work carrier with a substantially circular movement. The throw of the crank is such that the openings 11 in the work carrier will overlap both the inner and outer edges of the lapping surfaces of the laps 6 and 7, so that articles being lapped, as will be later described, will also overlap the inner and outer edges of the laps during lapping operation, and will thus produce an even surface wear and prevent the formation of shoulders on said laps. Each of the openings 11 is of a size to contain a plurality of articles to be lapped, such as rings 13-13.

In order to space articles from each other and to cause the latter to remain adjacent the outside of the openings 11 so that each article will receive substantially the same lapping treatment, I provide what I term a secondary carrier plate, such as 14, for each opening in the work carrier. In the specific form shown, these secondary carrier plates 14-14 are slightly larger than the openings 11-11 in the work carrier, and preferably rest on the edges adjacent said openings. The pockets in the secondary carrier plates for receiving the articles 13-13 to be lapped are distributed around the outside or periphery thereof, in substantially circular arrangement, and are so positioned that articles held within the pockets in the secondary carrier plates will be spaced around in the openings 11 in the main carrier 10 substantially in a circle. The articles preferably fit rather loosely so as to permit independent relative rotary movement between the secondary carrier plates 14 and the work carrier 10, and between the articles and the secondary carriers 14.

The specific form of machine herein dis-

closed is what may be termed a "floating" work carrier type of machine, that is to say, the work carrier is relatively free to rotate about the crank pin 12 during the actuation of the work carrier by means of the crank.

The operation is as follows:

The laps 6 and 7 are relatively separated (by any suitable means, not shown) and the machine loaded by placing articles to be lapped, such as rings 13—13, within the pockets in the secondary carrier plates 14—14, which carrier plates and the pockets therein are positioned so as to space the articles in the openings 11 in the work carrier. A suitable abrasive substance, such as oil and emery dust, may be applied to the articles when in position, after which the upper and lower laps move toward each other until the upper lap rests upon the articles to be lapped. The crank pin 12, positioned in the hole in the boss on the work carrier, serves to drive the center of the main work carrier 10 in a circle about the center of the operating shaft 15. During this operation, the main work carrier 10, while its center is constrained to move in a circle around the center of the shaft 15, is free to rotate in either direction about its own axis, under the influence of the articles contacting with the two lapping discs. It has been found in practice that the work carrier 10, during the rotation of the shaft 15, will creep around between the discs; that is to say, it will rotate about its own axis. It has likewise been found that the secondary carrier plates 14 will also rotate about their own axes or creep around the center of the openings 11 in the main carrier. During this creeping around movement it is, of course, obvious that the articles carried by plates 14—14 will likewise be progressed around within the openings 11. The articles 14 will likewise partake of a rotation about their own centers, or, in other words, will turn within the pockets in the secondary carrier plates.

It will be seen, therefore, that each of the articles during operation of the machine will partake of four different motions, namely, (1) movement toward and from the center of the machine by reason of actuation by the crank 12; (2) rotation about the center or axis of the main work carrier; (3) rotation about the center of the openings 11 in the main work carrier, and (4) individual rotation of each article about its own axis within its pockets in the secondary carrier plate. It will thus be seen that, during operation of the machine, each of the articles may partake of substantially the same movement as every other article, and each will receive substantially the same treatment until all the articles are lapped down to the desired dimensions.

During the operation the articles will

overlap both the inner and outer edges of the two laps, as will be clear from Fig. 1, and it will thus be seen that no shoulders will be worn in the lapping discs, and hence the surfaces of both lapping plates will be worn uniformly.

By the means herein disclosed articles of a high degree of accuracy may be produced in quantity. The articles will be of uniform thickness, and opposite faces will be parallel to each other.

While the drawings are pictorial in character, they serve to illustrate the principles of the invention, and I do not wish to be limited to the exact form shown and described.

It will be noted that the so-called "main work carrier plate 10" functions as a main spacer plate for the articles to be lapped, and that the so-called "secondary carrier plates 14" function as secondary spacer plates for the articles to be lapped, and that all of said plates function conjointly in spacing and carrying the articles over the entire lapping surfaces of both lapping discs.

I claim:

1. In a lapping machine, a pair of opposed flat lapping discs, a main work carrier plate between said discs, means for circularly moving one of said parts with reference to the other, the main work carrier having a plurality of openings therein, a secondary work carrier plate for one or more of said openings, said secondary carrier plate having a plurality of pockets for holding articles to be lapped, said secondary carrier being positioned so as to cause articles held therein to lie within the opening of the main work carrier.

2. In a lapping machine, a pair of opposed flat lapping discs, a main work carrier positioned between said discs, means for circularly moving one of said parts with reference to the other, the main work carrier having a plurality of openings therein, each opening being adapted to receive a plurality of articles to be lapped, a secondary work carrier for each of said openings in the main work carrier, each of said secondary carriers having pockets for receiving articles in the openings of the main work carrier for spacing them apart and holding same in predetermined relative positions.

3. In a lapping machine, a pair of opposed flat lapping discs, a main work carrier positioned between said discs and having a plurality of openings therein, a secondary work carrier for each opening, each secondary carrier having pockets therein for confining and spacing individual articles to be lapped, the pockets in said secondary carriers serving to confine articles to be lapped within the openings in the main work carrier, and means for moving

said main work carrier between said lapping discs to cause the articles to be lapped.

4. In a lapping machine, a pair of opposed flat lapping discs, a main work carrier positioned between said discs, means for circularly moving one of said parts with reference to the other, the main work carrier having a plurality of openings for receiving articles to be lapped, a secondary work carrier for each of said openings and having pockets therein to receive the articles in said main work carrier openings.

5. In a lapping machine, a pair of opposed flat lapping discs, a main work carrier positioned between said discs, means for circularly moving one of said parts with reference to the other, the main work carrier having a plurality of openings therein for receiving the articles to be lapped, a secondary work carrier for each of said openings, each secondary carrier having a plurality of pockets for receiving the articles in said main work carrier openings, the means for circumferentially moving the parts with reference to each other leaving said secondary carriers and the articles being lapped free to move under the influence of the articles being lapped and the work carrier.

6. In a lapping machine, a pair of non-rotatable flat lapping discs, a main work carrier positioned between said discs and having openings therein for receiving articles to be lapped, a secondary work carrier for each opening, said secondary carrier having pockets therein for receiving articles being lapped and serving to space the articles in the main work carrier openings apart and in predetermined relation to each other, a crank co-acting with said main work carrier at a point substantially at the center thereof, whereby when the crank is rotated the main work carrier will be given a mo-

tion around the axial center of the lapping discs, and the articles and secondary carriers will be free to move under the influence of the laps on said articles.

7. In a lapping machine, a pair of opposed flat, annular lapping discs, a main work carrier positioned between said discs and having openings therein for receiving articles to be lapped, a secondary work carrier for each of said openings, each of the latter having pockets therein for receiving individual articles in said main work carrier openings, the pockets in said secondary carrier plates being arranged in circular order, means for moving said lapping discs and work carriers relatively to each other, so that some of the articles held in said secondary carrier plates and openings in the main work carrier will overlap the inner and outer edges of said lapping discs during the course of the lapping operation.

8. In a lapping machine, a pair of opposed flat lapping discs, a main work carrier positioned between said discs, means for circularly moving one of said parts with reference to the other, the main work carrier having openings therein for articles to be lapped, a secondary work carrier for each of said openings, said secondary carrier having pockets serving to hold a plurality of articles in predetermined relative position in said main work carrier openings, and means for moving said work carriers between said discs to cause the articles held in said work carriers to be lapped and whereby the articles in each secondary carrier will partake of a rotary motion about the center of the secondary work carrier and a rotary motion about the center of the main work carrier and a motion about the openings in the main work carrier and motion about their own centers.

JOHN W. SMITH.