July 21, 1931. S. HOLT 1,815,104

LAPPING MACHINE

Filed Sept. 30, 1930

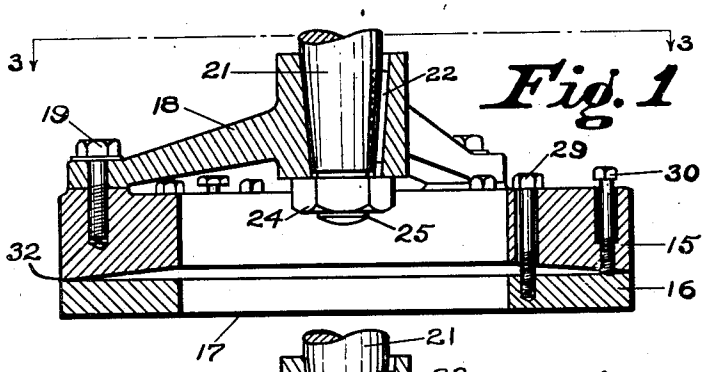


Fig. 1

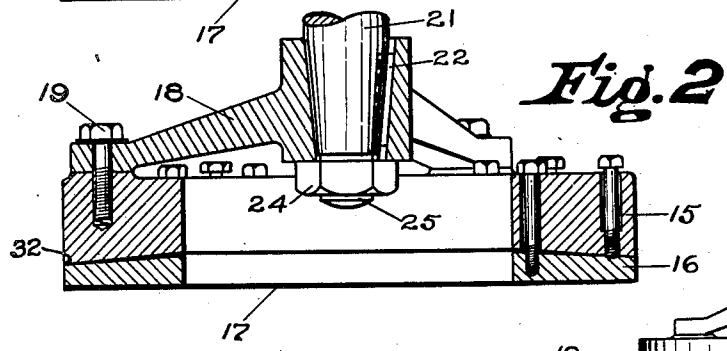


Fig. 2

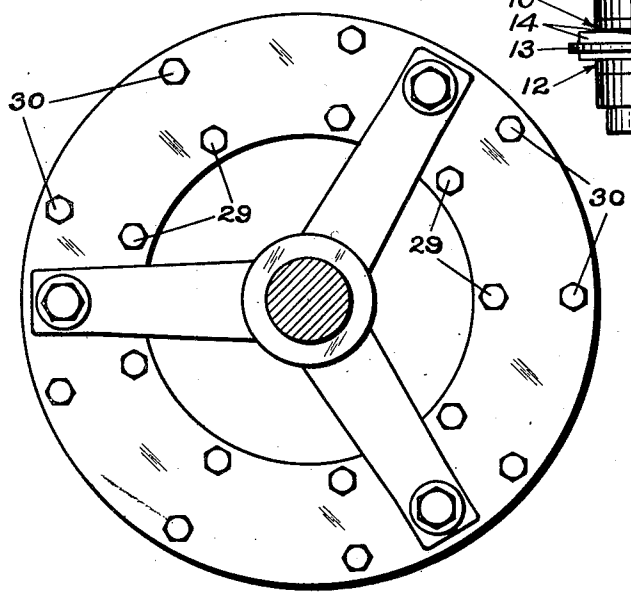


Fig. 3

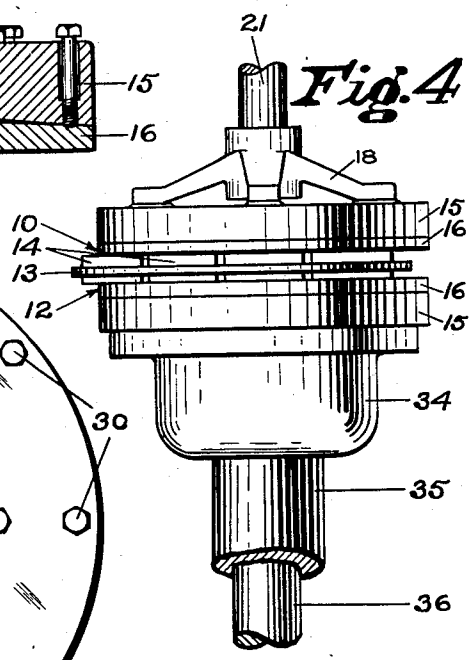


Fig. 4

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WITNESS

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UNITED STATES PATENT OFFICE

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LAPPING MACHINE

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This invention relates to improvements in lapping machines and especially to a lapping element for such machines which tends to wear unevenly.

Heretofore, it has been common practice to perform a mechanical lapping operation by mounting several work pieces within a guiding cage movably positioned between two parallel opposed lapping surfaces, and eccentrically rotating said work cage and laps relatively, thereby causing the work pieces to go through a series of irregular motions while in engagement with said laps. One familar type of lap for such a machine comprises an annular metal ring or disk which has its flat operative surface charged with abrasive grains. In lapping certain types of work, there is often an uneven wear upon the operative lapping surface, especially when lapping long narrow work pieces, which results in the lap surface becoming conical or otherwise misshaped so that it no longer lies in a single plane. Any uneven wear upon the lap causes a corresponding unevenness upon the work pieces and thus results in imperfect work. When a work piece is revolved by the rotating work cage over such a surface, a much faster abrading action will often occur at the outer periphery of the annulus than at its inner periphery, since the portion of the work engaging the outer periphery moves over a larger diameter during the same time interval that the work moves over the inner periphery and at a relatively greater speed. This faster abrading action over such portions of the lap creates an uneven wear thereupon and is apt to cause corresponding inaccuracies in the work, necessitating frequent truing operations which involve a considerable loss of time and expense. Since a metal lap of this type may only be charged with abrasive grains at its working surface, it must necessarily be recharged after every truing operation, which involves a further expense and loss of operating time of the machine.

The object of this invention is to provide a lapping member which is so constructed that as it wears away compensation for uneven wear may be effected to make the entire lapping surface lie in a true plane, thereby increasing the period of active service of the lap as well as the productivity of the machine.

With this and other objects in view, as will be apparent in the following disclosure, my invention resides in the combination of parts set forth in the specification and covered by the claims appended hereto.

Referring to the drawings which illustrate one embodiment of the invention, and in which like reference numerals indicate like parts:

Fig. 1 is a vertical sectional view of the lapping member and a support therefor broken away, showing a lapping element mounted on a lapping head before any wear has occurred to cause the operative lapping surface to be out of true;

Fig. 2 is a similar view, but showing the lapping element deformed to compensate for its uneven wear;

Fig. 3 is a horizontal section on the line 3—3 of Fig. 1 showing a plan view of the lapping head; and

Fig. 4 is a vertical elevation, partly broken away, of a lapping machine embodying the invention.

In accordance with my invention, I have provided a lapping machine, which may be of the type shown in the patent to Indge No. 1,610,527, comprising two parallel opposed lapping members and a work positioning cage interposed therebetween, said laps and cage being relatively rotatable to cause a lapping operation. The two opposed laps have their active abrading surfaces arranged preferably in parallel planes and they may be annular in form and mounted concentrically one above the other. One of the lapping members, or both, is so constructed that it may be deformed to compensate for any uneven wear upon the lap surface which has resulted in an out-of-plane condition, and thereby cause the active abrading surface to lie entirely within the same plane. To this end, I may make the lap in two parts, a lapping element and a supporting head, one of which is fulcrumed on the other and preferably adjacent that periphery where the

greater wear occurs so that the element may be deformed to correct its out of true condition. I also provide means for deforming the worn element to move the portion of it subjected to the lesser wear so as to return its abrading surface to such a position that the whole surface lies in substantially the same plane.

Referring to the drawings, I have therein shown one specific form of my invention especially adapted for lapping long pieces of work, although it may be utilized to lap various types of flat and cylindrical work with equal success. Referring to Fig. 4, I have there shown a lapping machine of the type described in the Indge patent which comprises two opposed upper and lower lapping members 10 and 12 with a work cage 13 interposed therebetween for carrying a plurality of work pieces 14, one of said members and the cage being relatively rotatable to produce a lapping operation.

It has been found that a circular lap does not usually wear evenly but tends to approach a conical surface, especially when long narrow work pieces are moved along its peripheral surface during the lapping action, owing to the fact that the portion of the work contacting with the outer portion of a flat circular lap is subjected to a greater abrading action than that portion of the work contacting with the inner lap periphery during the same abrading period. To overcome this difficulty and save the necessity of very frequent and expensive truing and recharging operations, I have provided a means whereby the lapping element may be sprung or flexed back to a single lapping plane as the lap becomes worn. To accomplish this, I make the lap in two parts, one being a supporting head 15 and the other a thin deformable metal lapping element 16 charged with abrasive grains at its abrading surface 17. The lapping head 15 is supported from a spider member 18 by means of suitable screws 19. The spider 18 is affixed to the end of a shaft 21 by a key 22 and a nut 24 screwed onto a threaded portion 25 of the shaft. The shaft 21 may be arranged for vertical movement to move the upper lap toward and from the work and also for rotation if it is desired to rotate the lap relative to the work.

The lower face of the annular lapping head 15 is beveled to provide a peripherally raised edge 32 which may serve as a fulcrum about which the operator may flex the annular lapping element 16. The inner portion of the element is secured to the head 15 by means of spaced tension screws 29 which are freely mounted in the head 15 and threaded into the element 16 and located close to the inner peripheries of the concentric lapping head and element. After the portion of the lapping element adjacent to its outer periphery has worn to a detrimental extent, the operator may tighten the tension screws 29 and thereby spring or flex the inner portion of the element into the same plane with its outer peripheral portion, as indicated in Fig. 2 of the drawings.

Should the lapping element become excessively worn push screws 30, which are threaded into the head 15 and engage the adjacent surface of the lapping element 16, may be utilized to further deform the lapping element. These press against the lap close to its outer periphery and serve as a supplementary fulcrum in place of the raised edge 32 on the beveled portion of the head.

The same type of lapping member may be equally well applied to the lower laps as indicated in Fig. 4, and the construction of the parts will be as above described. In this figure, the lower lap 12 is mounted on a rotatable support 34 which is driven by means of a power rotated sleeve 35, and the cage 13 is eccentrically rotated by a member 36, as fully described in said patent.

The operation and utility of the device will be readily apparent from the above description. By means of this construction, I have increased the life of the lap and the productivity of the machine as well as insured accuracy of operation for producing a large number of pieces of work.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A lapping machine comprising two opposed lapping members and a work cage interposed therebetween, one of which is rotatable relative to the other to cause a lapping action, said lapping members having their operative faces in parallelism, and means to deform one of said members after it has been worn out of true to again bring its operative surface into a true and accurate lapping plane.

2. A lapping machine comprising two opposed lapping members and a work cage interposed therebetween which are relatively rotatable to cause a lapping action, one of said lapping members being composed of a supporting head and a lapping element, and means for adjustably securing the lapping element to the head and for deforming the element to compensate for uneven wear upon its abrading surface and so bring the entire lapping surface within the same plane.

3. A lapping machine comprising two opposed lapping members and a work cage interposed therebetween which are relatively rotatable to perform a lapping operation, one of the lapping members being composed of a supporting head and a lapping element fulcrumed adjacent the periphery of said head, and manually operable means whereby the element may be deformed to compensate for any uneven wear thereon and thus make its operative surface lie within the same plane.

4. A lapping device comprising a supporting member and a lapping element movably secured thereto and means to flex the lapping element whereby the active lapping surface may be deformed to compensate for any uneven wear and thereby bring said surface back into the same plane.

5. A lapping device comprising a supporting member and a lapping element removably secured thereto, means fulcruming the lapping element upon the periphery of the supporting member and means for flexing the inner portion of the lapping element to compensate for uneven wear upon the lapping surface to bring said surface within the same plane.

6. A lapping device comprising a supporting member and an annular lapping element removably secured thereto, means fulcruming the lapping element adjacent to the periphery of the supporting member and spaced clamping screws securing the lapping element to the supporting member at a distance remote from the fulcrum which may serve to flex the inner portion of said element and return its operative face to a single lapping plane and thereby compensate for any uneven wear thereon.

Signed at Brooklyn, N. Y., this 3rd day of Sept., 1930.

SAMUEL HOLL.