LAPPING MACHINE HAVING WEAR RING POSITIONING MEANS

Ronald Frederick Wright, Flixton, Urmston, England, assignor to Flexibloc Limited, Manchester, England, a British company

Filed Feb. 17, 1966, Ser. No. 528,313

Claims priority, application Great Britain, Feb. 18, 1965, 6,996/65

U.S. Cl. 51—129

Int. Cl. B24b 3/00, 29/00

ABSTRACT OF THE DISCLOSURE

A lapping machine comprising a lapping plate adapted to carry a wear ring or rings. Control means are provided adjacent the centre of the plate and independently of the drive of the plate to vary the radial position of the wear rings.

This invention relates to lapping machines of the type having a rotatable lapping plate on which are freely located a plurality of wear rings which during rotation of the lapping plate are prevented from rotating with the plate by rollers mounted on arms extending inwardly from adjacent the periphery of the plate. The rings however are free to rotate about their own axes. In operation of such lapping machines the workpieces to be treated are placed on the lapping plate within the wear rings and the relative movement between the rings and the plate causes the surface of the workpiece contacting the lapping plate to be ground or lapped. If, however, the wear rings are maintained in the same radial position relative to the lapping plate there is a tendency for the surface of the plate to become concave or convex depending on the position of the rings. In order to overcome this it has previously been proposed to adjust the position of the ring-contacting rollers so as to vary the positions of the rings on the plate as desired in order to exercise control over the flatness of the plate. Positional control of the rollers has been effected by linkage mechanisms which tend to be complex.

An object of the present invention is to provide improved means for controlling the position of wear rings on lapping plates so as to enable the flatness of the plate to be controlled.

According to the present invention, there is provided a lapping machine comprising a lapping plate adapted to carry a wear ring or rings drive means for effecting rotation of the plate, ring contacting means located adjacent the centre of the plate, and control means independent of the drive of the plate actuable to vary the radial position relative to the plate of that surface of the ring-contacting means which is adapted to engage the ring or rings.

Embodiments of the present invention will now be described by way of example, with reference to the accompanying drawings in which:

FIG. 1 is a sectional elevation of one form of central control device for a lapping plate.

FIG. 2 is a plan view of a lapping plate having a second form of central control device.

FIG. 3 is a detail plan view of the central control device illustrated generally in FIG. 2 and

FIG. 4 is sectional view on the line IV—IV of FIG. 2.

Referring firstly to FIG. 1 of the drawings, which shows a first embodiment of the invention, a lapping machine comprises a lapping plate provided with a centrally tapped hole which is adapted to receive a screw-threaded extension 5 on the lower end of a vertical pillar 6. This pillar has a surrounding sleeve 7 arranged so as to slide along the axis of the pillar but restrained from rotating around the pillar by means of a cross-member 8 which engages slots 9 in the pillar 6. A freely rotatable tapered roller 10 which decreases in diameter from its upper end towards its lower end is mounted on the sleeve 7. Vertical adjustment of the surrounding sleeve 7 is obtained by means of a central screw-threaded extension 11 which engages an internal thread in a vertical bore 12 of the cross-member 8 and which spindle carries at its upper end a handwheel 13 whereby the spindle 11 can be manually rotated. The spindle 11 is centrally located at its upper end by a cap 14 so that the spindle is free to rotate in the cap but is restrained from relative vertical movement thereto. By screwing the spindle 11 into or out of the pillar 6 the roller 10 can be raised or lowered.

An inherent feature of the arrangement is that it is self-locking so that there is no possibility of the setting being altered inadvertently due to the action of the lower rings 15 and the workpieces contained therein as the wear rings press against and rotate with the tapered roller 10.

In use of the above embodiment, wear rings 15 are positioned on the lapping plate in the customary manner so that they lie around the central spindle 11. The outer upper peripheral edge of each ring is in line with the tapered roller 10 of the spindle and each such peripheral edge is tapered to correspond to the roller taper. Thus when the surface 16 of the lapping plate becomes concave or convex due to the wear caused by the relative rotation between the plate and the rings, the position of the rings 15 is merely altered to compensate by rotating the spindle 11 thereby moving the roller 10 up or down and causing the wear rings to move radially in or out to a corresponding extent and thus causing wear of the plate at a different location.

In a second embodiment of the invention as illustrated in FIGS. 2 to 4, a lapping machine comprises a lapping plate 20 adapted to carry wear rings 21 in the way previously described above. Extending over the plate 20 is a supporting arm 22 which carries a depending spindle 23 which terminates a short distance above the centre of the plate. The upper end of the spindle carries a worm wheel 24 which meshes with a worm shaft 25 mounted on a bracket on the supporting arm, the worm shaft being rotatable by means of an associated hand wheel 26. The lower end of the spindle carries three freely rotatable rollers 27, carried between a pair of locating plates 28.

During operation of the machine a wear ring 21 is maintained in contact with each of the rollers 27 by means of further rollers 29 mounted on brackets 30 adjacent the periphery of the lapping plate. When the radial position of the wear rings on the plate has to be altered in order to compensate for the wear in their existing position, the worm shaft 25 is merely manually rotated to cause rotation of the depending spindle 23. In doing so the position of the wear rings 21 is changed relative to the rollers 27 on the depending spindle 23 and relative to the other fixed rollers 29 positioned on the machine framework near to the periphery of the lapping plate. The wear rings 21 are thereby moved to different radial positions on the lapping plate. An inherent feature of the arrangement is that it is self-locking so that there is no possibility of the setting being altered inadvertently due to the action of the wear rings and the workpieces contained therein as the wear rings press against and rotate with the rollers 27 on the depending spindle 23.

It will be apparent that the embodiments described above which provide arrangements operable from mechanism positioned adjacent the centre of the lapping plate have the substantial advantage that an additional mechanism is required to control all of the wear-rings compared with previously proposed arrangements where separate
mechanisms had to be employed to control each wear-
ing and each of which extended radially inwards over the
lapping plate.

It will be apparent that other mechanisms embodying
the same principle of operating from adjacent the centre of
the plate can be devised e.g. the positional control of the
wear ring-contacting rollers in the second embodiment
could be effected by means of a cam or cams. Further, the
supporting and adjusting elements can be positioned be-
low the lapping plate so that in the second above-described
embodiment only the rollers mounted on a vertical shaft
taken through the centre of the lapping plate, would pro-
trude above the top surface of the plate.

By means of the present invention, it will be apparent
that there is provided a means of controlling the radial po-
sition of wear rings on a lapping machine from the centre
of the plate. This is effected merely by varying radially
the position of that surface of the central ring-contacting
means which actually contacts the rings. In the case of
the first embodiment this surface is formed by the tapered
surface on the roller 10 and in the second embodiment by
the circumferential surfaces of the rollers 27.

What I claim is:

1. A lapping machine comprising a lapping plate
adapted to carry a plurality of wear rings; drive means
for effecting rotation of said plate; ring-contacting means
located at the axis of said plate and having a tapered
ring-contacting surface adapted to move axial said plate
to contact said rings adjacent the center of said plate;
and control means independent of said drive means of
said plate actuable to bring a different diameter of said
tapered ring-contacting surface into contact with said
rings to vary the radial position of said rings on said
plate.

2. A machine as claimed in claim 1, in which said
control means includes a spindle located axially of said
plate and rotatable in order to move said tapered ring-
contacting surface.

3. A machine as claimed in claim 2, wherein said ring-
contacting means is a freely rotatable roller mounted on
said spindle having said tapered ring-contacting surface
as its outer configuration; and said spindle is threaded and
when rotated axially moves said roller.

4. A lapping machine comprising a lapping plate
adapted to carry a plurality of wear rings; drive means
for rotating said plate; a plurality of spaced first rollers
located adjacent the center of said plate; a plurality of
fixedly spaced second rollers, independent of said first
rollers, mounted adjacent the outer periphery of said plate
and adapted to retain said wear rings against said first
rollers; and control means independent of said drive means
located at the axis of said plate, which control means in-
cludes a rotatable spindle adapted to simultaneously arcu-
ately move said first rollers to radially space said wear
rings.

5. A machine as claimed in claim 4 wherein said first
and second rollers are accurately equi-spaced and freely
rotatable about their respective axes.

6. A machine as claimed in claim 4 in which said rot-
atable spindle is rotated by a worm wheel engaged by a
worm shaft.

References Cited

UNITED STATES PATENTS
1,610,768 12/1926 Graham.
2,627,144 2/1953 Rosenthal 51—129
2,740,237 4/1956 Day 51—133

FOREIGN PATENTS
345,443 12/1921 Germany.

HAROLD D. WHITEHEAD, Primary Examiner.

U.S. Cl. X.R.

51—131