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2,391,388

GRINDING AND LAPPING MACHINE

Filed July 5, 1943

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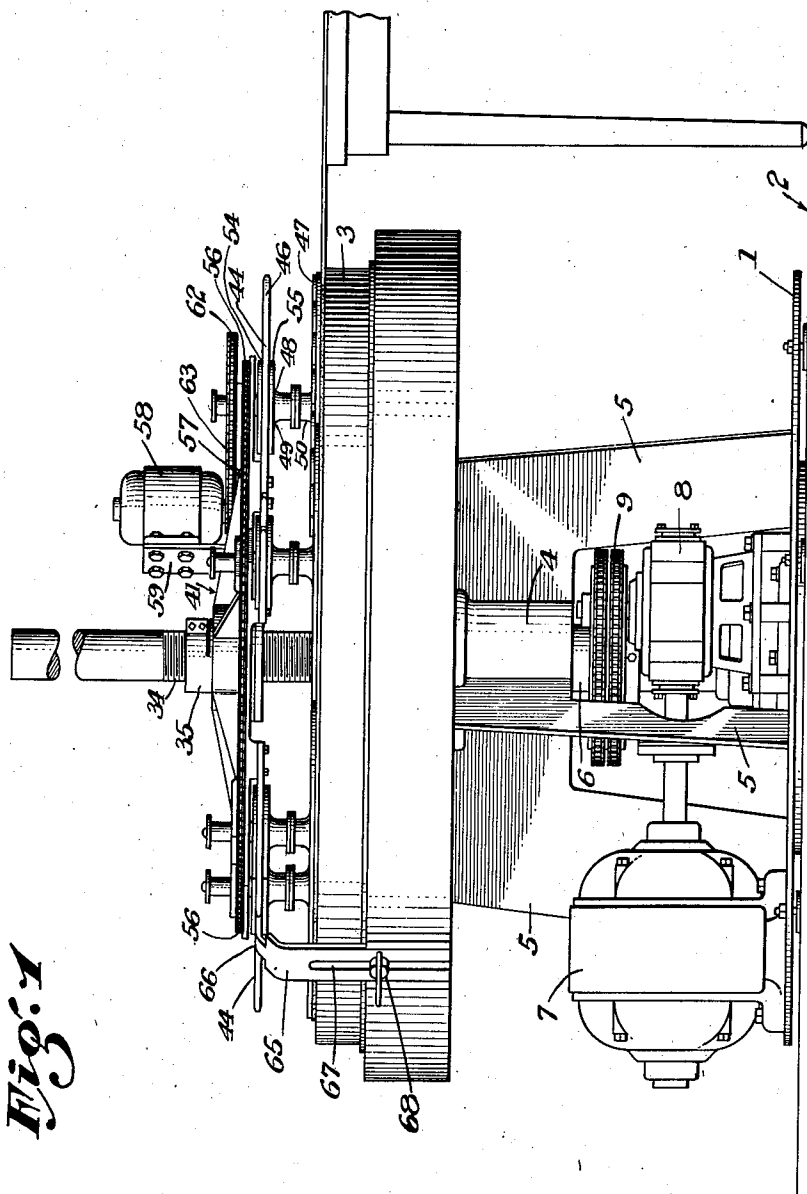


Fig. 1

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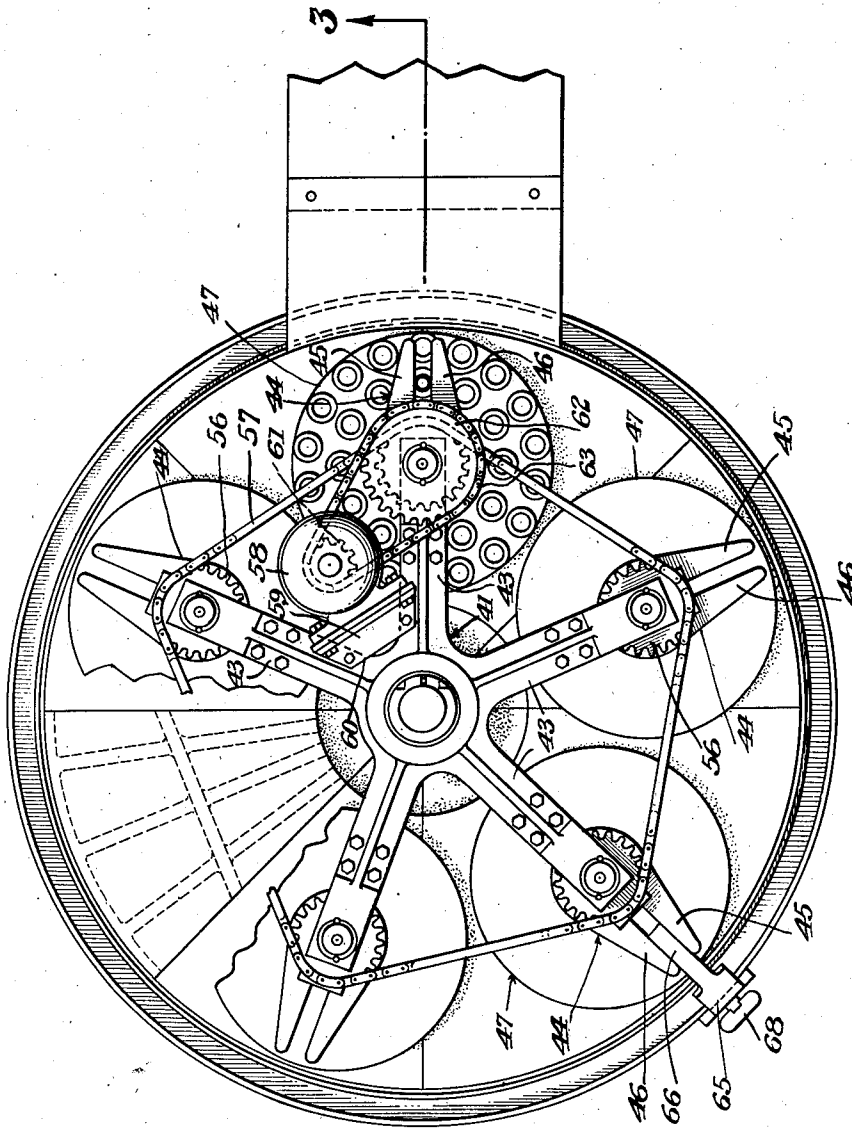
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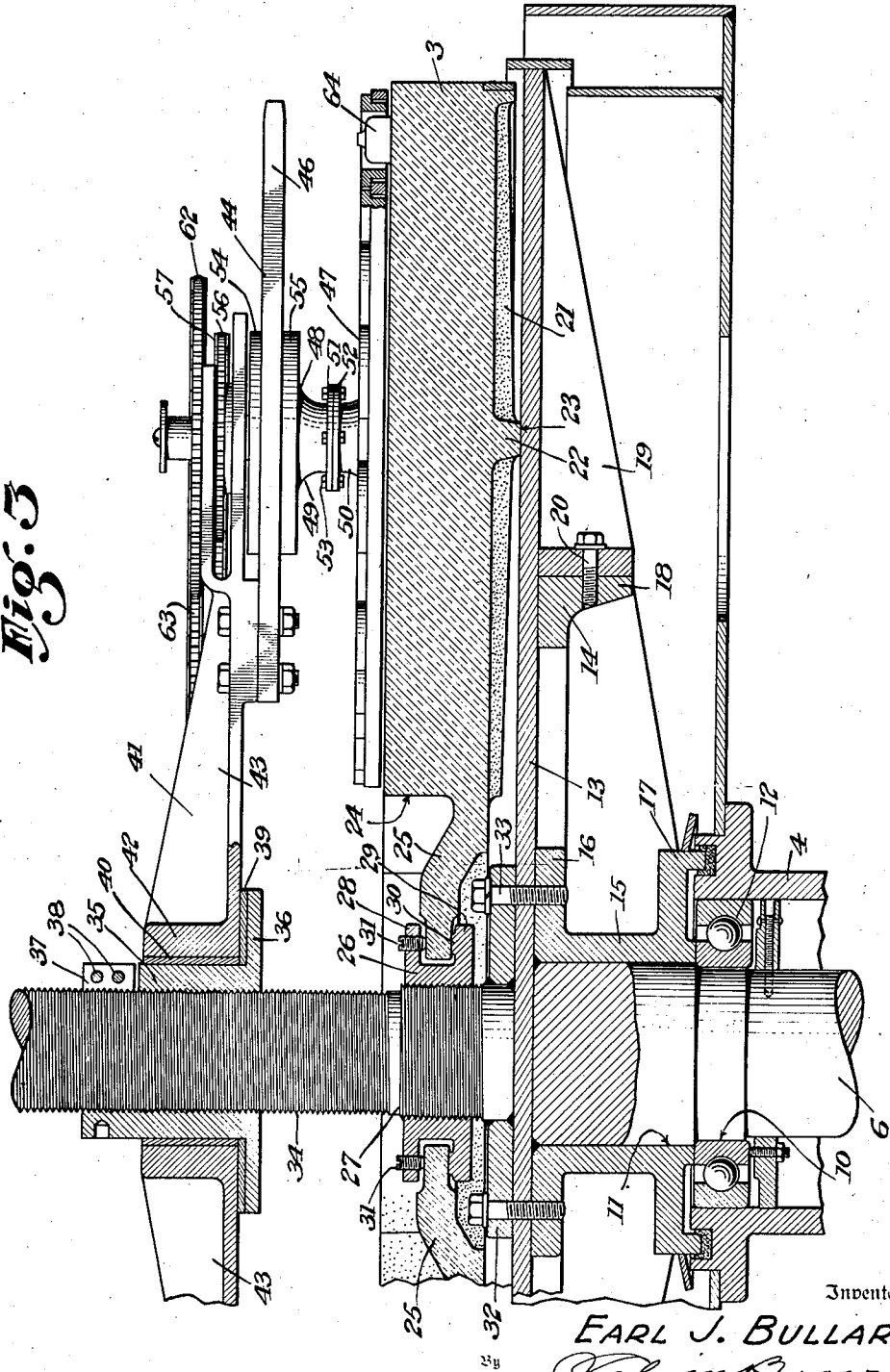
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Fig. 3



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UNITED STATES PATENT OFFICE

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GRINDING AND LAPPING MACHINE

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3 Claims. (Cl. 51—131)

This invention contemplates an improvement upon my grinding and lapping machine as disclosed in U. S. Letters Patent No. 2,209,071, issued July 23, 1940.

An object of the present invention is to prevent synchronism between movement of a lap and the work.

I have found in actual practice that where a lap together with a work holder is revolved by a common means, although at differential speeds, a synchronism of movement results which causes the lap to wear unevenly and become wavy in form, thereby requiring replanning of the lap. The present invention overcomes the difficulty aforesaid, with starting and stopping of the lap independent of any movement of the work.

Another object is the provision of a novel lap which is so constructed and arranged that the working surface thereof may be maintained in a selected plane.

With respect to the foregoing object it may be pointed out that laps of the character of the present invention are quite large, being six feet or more in diameter and weighing three tons or more. Dressing of such a lap entails time and expense, and likewise requires the cutting away of the working surface of the lap in order to provide a plane surface. With the present invention I have provided a lap so constructed and its parts so arranged that the working surface of the lap may at all times be maintained with a given surface, with the result that a minimum amount of stock is taken away.

Another object of the invention resides in the provision of suitable means which will quickly and efficiently allow for adjustability of a work holder to accommodate various thicknesses of work.

In the drawings:

Fig. 1 is a partial fragmentary elevation of the complete grinding and lapping machine;

Fig. 2 is a fragmentary top plan view of the lapping machine; and

Fig. 3 is an enlarged fragmentary transverse sectional view on the line 3—3 of Fig. 2.

Referring now to the drawings, it may be stated that for a full and complete explanation of the grinding and lapping machine reference is made to my U. S. Letters Patent No. 2,209,071. The present description will be directed primarily to the improvements made in certain members of the grinding and lapping machine.

The grinding and lapping machine, briefly, is adapted to be supported by a base 1 upon a suitable foundation such as a floor 2. The lap 3

and its associated members are carried upon a tubular pedestal 4 standing between the said lap and its associated mechanism and base 1, said pedestal being braced by a plurality of spaced legs 5 positioned between the pedestal and the base 1. Extending axially of the pedestal 4 is a spindle or shaft 6. A motor 7 supported on floor 2 is adapted to drive the spindle or shaft 6 through the medium of reduction drives 8 and 9, these reduction drives constitute a transmission means. In the present instance, by way of example, the gear reduction between the drive 8 and the motor is substantially ten to one, and between the drive 9 and the spindle or shaft 6 a reduction of three to one. It is obvious that various reduced speed means may be utilized.

The shaft 6 is changed in diameter so as to have enlarged portions with respect to the overall length of said shaft at 10 and 11, there being suitable bearing means indicated generally as 12 between the shaft diameter portion 10 and the pedestal 4, and adjacent the upper end of said pedestal. The platform or table 13 for the lap 3 is supported by means 14 which is carried on the portion 11 of shaft 6. The means 14 comprises an annulus 15 provided with spaced-apart end flanges 16 and 17. The flange 16 is provided with an end flange 18, to which are secured ribs 19 (of which there may be a spaced plurality depending from the under surface of the platform or table 13), by means of bolts 20.

The lap 3 is adapted to fulcrum on the platform or table 13. The lap in the present instance consists of a plurality of sectors, as best shown in Fig. 2. The sectors are arranged so as to form a complete annulus. Each lap sector is radially cored on its bottom surface, as indicated at 21 to reduce weight, and the base is provided with a fulcrum 22 extending between the sides of the sector, and which may be intermediately positioned between the curved ends of said sector. This fulcrum does not in the present instance have a knife edge but has a flat surface 23 in engagement with the platform. Each sector of the lap is provided, adjacent its inner curved end 24, with a bent arm 25, which arm is adapted to cooperate with nut 26 in such a way that movement of the nut will simultaneously tip all of said lap sectors relative to the fulcrum points thereof. Nut 26 is threaded on a shaft 27; preferably the threads are 12 or less to the inch so as to permit adjustment of the laps if the laps are to be tipped. Nut 26 is provided with end flanges 28 and 29, and between said flanges is positioned an end portion of each lap arm 25. The flange 29 is provided with an emboss-

ment at 30, the embossment engaging each arm 25, while one or more adjustment screws 31 are in threaded engagement with the top flange 28 for contact with the arms 25, each arm being held between the embossment 30 and one or more of the screws 31. The shaft 27 has welded thereto a flange 32. Flange 32 in turn is held in operative relationship with the platform 13 and flange 16 of the means 14 by bolts 33.

The shaft 27 is provided substantially throughout its length, starting with the termination of the threaded area for nut 26, with coarse threads 34. The coarse threads may run eight to the inch, more or less. This threaded area carries a nut 35, provided with an end flange 36. The nut 35 is split longitudinally and horizontally to provide collet 37, which carries bolts 38. Thus having adjusted the nut as to position on shaft 27 the bolts 38 may be tightened to clamp the collet 37 on the shaft and prevent any rotation of the nut. The nut carries a washer 39 on its flange 36 and a bushing 40.

A spider, designated generally as 41, is provided with a hub 42 which rests on the washer 39 and bears against bushing 40. The spider is provided with a plurality of equidistantly spaced arms radiating from the hub, these arms being designated generally by 43, see Fig. 2. Each spider arm carries a member 44, which is forklike or bifurcated in form, in that it constitutes a pair of spaced-apart arms 45 and 46. Member 44 supports a workholding disc 47. There is a plurality of workholding discs, as shown in Fig. 2, said discs being positioned above the lap. Each workholding disc 47 is provided with a hub 48 formed in two parts 49 and 50. Parts 49 and 50 are flanged at 51 and 52, and the flanges are held together in any suitable manner, such as by bolts 53. Part 49 is provided with two enlarged spaced-apart flanges 54 and 55, which bridge opposite sides of member 44. The construction is such that a member central of the flanges 54 and 55 is received in the way between the members 45 and 46. This construction is detailed in my patent heretofore mentioned. Each hub 48 is adapted to be rotated when a sprocket 56 associated therewith is driven. There is a sprocket 56 for driving each hub and a continuous chain 57 is passed around said sprockets. A motor 58 is secured to a suitable bracket 59, the bracket in turn being supported between two of the spider arms, as shown at 60 in Fig. 2. The motor shaft carries a sprocket 61 and one of the hub members for a workholding disc is provided with a sprocket 62, around which sprockets 61 and 62 is passed a continuous chain 63.

Each workholding disc is provided with a plurality of transverse openings, within which openings is placed the work, as is shown, for example, in Fig. 3 at 64.

The operation, uses and advantages of the invention just described are as follows:

It is intended that the lap should be driven through the transmission means by motor 7, and that the workholding disc should be rotated by motor 58. This is in order to prevent synchronism of movement between the workholding discs and the lap, and for the reasons pointed out in the statement of objects of the invention. The arrangement is such that a clutch means is provided between each workholding disc hub and the driving sprocket, to the end that the hub may be removed from between the members 45 and 46 to

make repairs to the workholding disc, if necessary. For a description of the construction see my Patent No. 2,209,071. However, in the present construction, by forming the hub 48 in two parts, the flanges 51 and 52 may be separated without disturbing other portions of the hub. This two-part hub construction is of value when different thicknesses of workholding discs are to be utilized. To begin with, the lap sectors may be adjusted so that the top surfaces of all sectors lie in the same plane by adjusting the nut 26 either upwardly or downwardly relative to the threaded shaft 27. When the top surface of the lap requires redressing, the lap is adjusted as desired by movement of nut 26 to bring the top surface of the laps into a common plane, followed by taking a cut across the lap and then repolishing. By way of example, the set screws 31 are loosened, whereupon the nut 26 is rotated either upwardly or downwardly to tip each lap sector about its fulcrum. After the required tipping, the lap sectors are all secured by the screws 31.

When it is desired to raise the workholding disc above the lap, motor 7 will turn the spindle or shaft 6 and likewise rotate simultaneously therewith, shaft 27, and if the spider is held against movement by the lock bar 65 (see Fig. 1), the nut 37 will travel on threads 34 in an upward direction relative to the shaft and lift the spider to any desired height, limited of course by the length of the threaded area. (I have assumed, of course, that the bolts 38 have been loosened so as to permit nut 35 to radially travel on the threads 34.) In this connection the lock bar 65 is provided with a nose 66 which enters between any one of the bifurcated members, and said lock bar is formed with a longitudinal slot 67 which allows this lock bar to be raised relative to a locking nut 68 secured to the framing.

When the workholding discs are positioned above the lap, with work such as 64 within the work-receiving openings, the lap is rotated and the workholding discs are likewise rotated, with the result that the work has the surface thereof ground by the lap.

I claim:

1. In a grinding and lapping machine, the combination of: a lap composed of independent sectors arranged in continuous annular relationship, and means for varying the angle of each sector relative to a horizontal plane.

2. In a grinding and lapping machine, the combination of: a continuous annular lap formed in sectors, a platform beneath said lap and a fulcrum for each sector in contact with said platform, and means for tipping each sector about its fulcrum to adjust the plane of said lap.

3. In a grinding and lapping machine, the combination of: a shaft, a motor for rotating said shaft, a platform supported on an end of said shaft, a second shaft co-axial with the first shaft and formed with two threaded zones, a nut carried on one of said threaded zones, a lap formed in sectors and operatively connected to said nut, whereby movement of said nut adjusts the plane of said sectors, a workholder positioned above said lap, a second nut upon the second threaded zone of said second shaft and a spider between said workholder and said nut, the turning of the second nut positioning the height of the workholder above said lap, and means for rotating the workholder.

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