April 28, 1959 H. ALLEMANN 2,883,897

ROTARY OR TURNING ARRANGEMENTS ON FASHIONING MACHINES

Filed Dec. 31, 1954 2 Sheets-Sheet 1

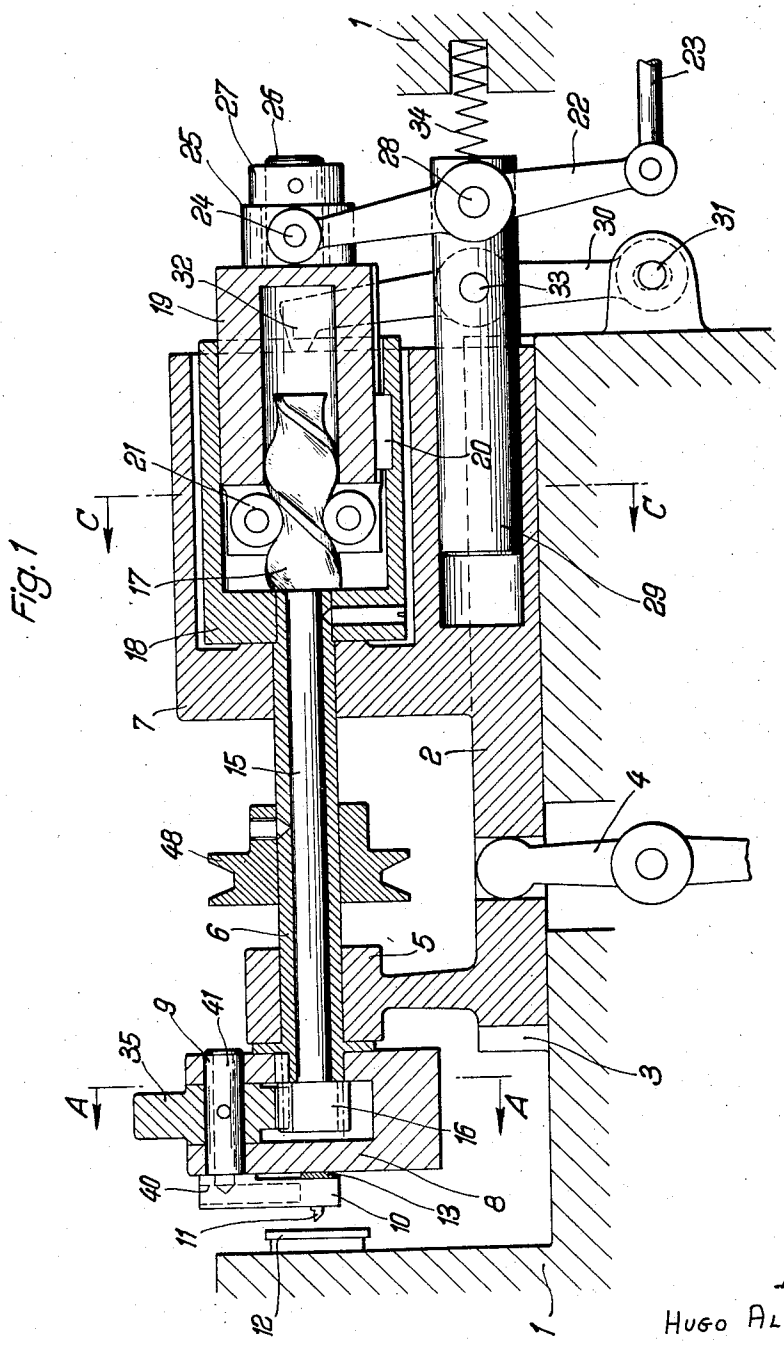


Fig. 1

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Fig. 2

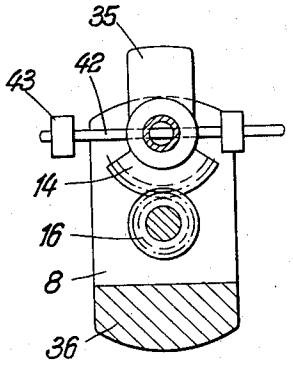



Fig. 3

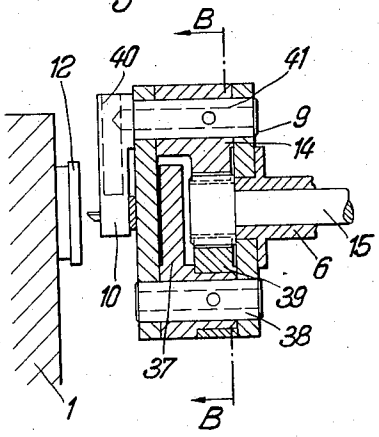



Fig. 5

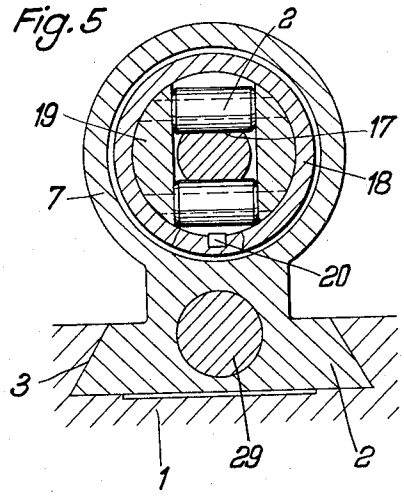



Fig. 4

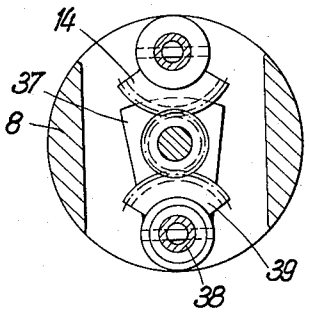



Fig. 6

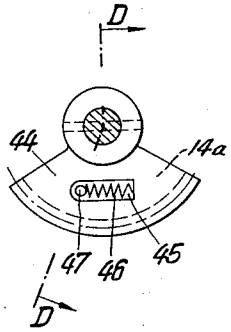
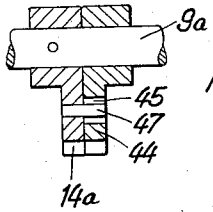



Fig. 7

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# ROTARY OR TURNING ARRANGEMENTS ON FASHIONING MACHINES

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7 Claims. (Cl. 82—2)

This invention relates to a rotary or turning arrangement provided on a fashioning machine and fitted with a rotatable tool holder movable transversely to the axis of rotation and adapted to hold a milling and turning tool for working instrument parts of precision used for instance in watches and the like, and consists in mounting the tool holder on a rocking lever and providing the arrangement with means for controlling the deflection of the rocking lever and automatically compensating mass action appearing thereon.

Embodiments of the invention are illustrated in the accompanying drawings, wherein—

Figure 1 is a longitudinal section of the rotary arrangement and of a part of the machine frame on which it is mounted;

Fig. 2, a cross section on the line A—A of Fig. 1;

Fig. 3 is a fragmentary sectional view of a modified detail of the device of Fig. 1;

Fig. 4, a cross section on the line B—B of Fig. 3;

Fig. 5, a cross section on the line C—C of Fig. 1;

Fig. 6, a top view of a modified embodiment of a detail; and

Fig. 7, a section on the line D—D of Fig. 6.

On the machine frame 1 a headstock 2 is displaceably mounted in a link guide 3 by making use of a lever 4 or any other suitable means. The headstock 2 carries a bearing 5, in which one end of a hollow shaft 6 is rotatably disposed, and opposite the bearing an upwardly extending housing 7 with a bearing for the other end of the hollow shaft.

Between the two bearings a driving element 48 secured to the hollow shaft 6 serves for rotating the shaft.

On the end of the hollow shaft 6 projecting beyond the bearing 5 for rotation therewith a U-shaped supporting element 8 is fixedly fastened. A shaft 9 is rotatably mounted on element 8 and has one end of an arm 10 fixedly fastened thereto. The free end of the arm 10 serves as holder for a milling and turning tool 11 in such a way that the cutting edge can be brought into the axis of rotation of the hollow shaft 6 and can also be moved away therefrom transversely to said axis, i.e. the eccentricity of the cutting edge of the tool may be varied from 0 to maximum. Opposite the tool the machine frame 1 is equipped with a holder for non-rotating workpieces 12. The surface of the supporting element 8 facing the arm 10 is super-finished and perfectly plane. A support 13 connected with the back of the arm 10 bears against this surface to take up the working pressure of the tool 11. A toothed segment 14 is mounted on the rotary shaft 9 and is fixedly connected therewith.

In the bore of the hollow shaft 6 a control rod 15 is rotatably arranged, and the end thereof facing the arm 10 is fitted with a pinion 16 the teeth of which are in mesh with those of the toothed segment 14. When the control rod 15 is turned, the arm 10, by way of the pinion 16 and toothed segment 14, is swung out within



certain limits, so that the tool 11 is removed from the axis of rotation transversely thereto.

In order to permit variation of the deflection of the arm 10 during rotation of the arrangement the headstock 2 is provided with a control device by means of which the pinion 16 can be turned by the control rod 15. For this purpose, the end of the control rod 15 remote from the arm 10 serves as a control member cooperating with the control device. The end of the rod 15 has two opposite helical surfaces 17 imparting a corkscrew-like appearance to this end which extends into a guide bushing 18 firmly connected with the end of the hollow shaft 6. Within the bushing 18 a control slide 19 with key 20 and guide groove is non-rotatably provided, so that the bushing 18 and the control slide 19 positively rotate with the hollow shaft 6. In the control slide 19 two rolls 21 are rotatably mounted which lie against the two helical surfaces 17 of the control member and effect turning of the control rod 15 when the slide 19 is axially displaced.

The control slide 19 can be adjusted axially at will by means of a two-armed lever 22 pivotable about a pin 28 and a rod 23 engaging one end of the lever 22. The other end of the lever 22 forms a fork and is connected by way of pivots 24 to a ring sleeve 25 which is movably secured to the necked-down cylindrical end portion 26v by a fixed collar 27 of control slide 19. The ring sleeve 25 has no axial clearance but sufficient radial play to permit arcuate movement of pivot 24 relative to the pin 28. During such movement, the pin 24 moves in a radial direction relative to cylindrical end portion 26.

The position of the pin 28 of the lever 22 is variable in dependence upon the displacements of the headstock 2. If the pin 28 were fixed, the slightest movement of the headstock 2 would result in a displacement of the control slide 19 and unintentional swinging of the arm 10. The pin 28 is therefore arranged on a slide 29 in a guide of the headstock 2, and any changes of position of the slide 29 are controlled by the longitudinal movements of the headstock 2. For this purpose, a double-armed control lever 30 is so disposed that one end thereof is articulated to a fixed point 31 of the machine frame 1 and its other end 32 freely bears against a face of the headstock 2. As the pivot 33 of the control lever 30 is also positioned on the slide 29, any longitudinal movement of the headstock 2 will be transmitted to the control lever 30 and thereby also to the pin 28 of lever 22, so that the pivots 24 on the control slide 19 as well as the slide itself are adjusted to the same amount relative to the headstock 2. The position of the control slide 19 with respect to the guide bushing 18 remains constant, however, and varies only in dependence upon motions of the rod 23. At another point of the machine frame 1 a compression spring 34 acting on the end of the slide 29 is provided, owing to which the free end of the control lever 30 is always urged against the corresponding bearing face on the headstock 2.

Due to the rotation of the hollow shaft 6, forces of inertia will appear at the arm 10 and produce a moment relative to its rotary shaft 9, which will increase with the lateral displacement of the arm. This moment can be balanced by the provision of a counter-mass 35 on the shaft 9, so that the lateral deflection of the arm 10 is compensated by a like deflection of the counter-mass 35 in the opposite direction. This involves of course the existence of a considerable one-sided total mass the resultant of which can be compensated by a corresponding mass accumulation at point 36 of the supporting element 8. Another solution of this particular problem consists in eliminating the counter-masses 35, 36 and employing a second arm on a rotary shaft 38 in the supporting element 8 opposite the rotary shaft 9 and pro-

viding the second arm **37** with a toothed segment **39** meshing with the pinion **16**, as indicated in Figs. 3 and 4. In this arrangement the rocking arm **37**, by means of the pinion **16**, would always carry out equal motions relative to the arm **10**. The masses of the arm **10** and rotary shaft **9** can be reduced by providing longitudinal bores **40**, **41**, and the rotary shaft **38** also may have such bores if required.

A further difficulty exists with respect to the elimination of play between the toothed segment **14** on the one hand and the pinion **16**, the regulating means **17** to **21** and the members **22**, **23** on the other, which is absolutely necessary for accurate work. As shown in Fig. 2, on a lever arm **42** an auxiliary mass **43** projecting transversely to the ideal central plane passing through the axis of rotation and the rotary shaft **9** of the arm **10** may be arranged, the action of which during rotation tends to increase the tooth pressure in one direction of rotation of the segment **14** and to compensate for any play in the movable parts. By the provision of two adjustable masses on both sides of the shaft **9** some variation of the mass action can be obtained. The arrangement shown in Figs. 6, 7 for compensation of play comprises a first toothed segment **14***a* non-rotatably secured to the shaft **9***a* of the rocking and an auxiliary toothed segment **44** freely rotatably disposed on this rotary shaft **9***a*, the segment **44** possessing a slot **45** in which a compression spring **46** is provided which with one end bears against the wall of the slot and with the other end against a pin **47** pressed into the toothed segment **14***a* and extending into the slot **45**. The pressure exerted by the spring **46** produces a torsional moment acting upon the auxiliary segment **44** and insures close contact with the teeth of the pinion **16**.

In a modified construction which, however, is not shown in the drawings, the headstock **2** is firmly connected with the machine frame **1**, and the holder of the workpiece **12** is axially displaceably arranged relative to the tool **11**. In this case the headstock **2** and the frame **1** may be made in one piece. This is a simplified construction, since the control lever **30**, the slide **29** and the compression spring **34** may be omitted. The pin **28** of the lever **22** would be fixed on the machine frame.

I claim:

1. In a machine tool, in combination, a support; shaft means mounted on said support for rotation relative thereto about an axis of rotation, said shaft means including concentric inner and outer shaft members; tool carrier means for carrying a tool and mounted on said outer shaft at one end thereof for rotation therewith about said axis of rotation as well as for pivotal movement relative to said outer shaft about a pivot axis which is spaced from the region at which a tool carried by said tool carrier means is attached thereto and which pivot axis is spaced from and parallel to said axis of rotation, said inner shaft member being connected at that end thereof which corresponds to said one end of said outer shaft member to said tool carrier means in such a manner that rotation of said shaft members relative to each other causes pivotal movement of said tool carrier means about said pivot axis and consequently movement of a tool carried by said tool carrier means in a direction transverse to said axis of rotation; and rotating means for rotating said shaft members relative to each other independently of the rotation of said outer shaft member, whereby a tool carried by said tool carrier means may, whenever desired, be rotated without being moved transversely, be moved transversely without being rotated, or be simultaneously rotated and moves transversely.



2. The combination defined in claim 1 wherein said rotating means include screw means on said inner shaft member in the region of its other end, screw engaging means mating with said screw means and carried by said outer shaft member in the region of its other end for rotation therewith but for axial movement relative thereto, and positioning means operatively associated with said screw engaging means for moving the latter axially, whereby said shaft members may be rotated relative to each other, thereby moving transversely a tool carried by said tool carrier means.

3. The combination defined in claim 2 wherein said positioning means include a pivotally mounted lever one end of which cooperates with said screw engaging means in such a manner that the latter is moved axially upon pivotal movement of said lever.

4. The combination defined in claim 3 wherein said support is mounted for sliding movement relative to a machine bed, and wherein mounting means are provided for so mounting said lever that the same maintains said screw engaging means in the same axial position during sliding movement of said support relative to said machine bed.

5. The combination defined in claim 1, and weight means mounted on said outer shaft for automatically maintaining the balance thereof despite the assumption of different positions of said tool carrier means, and a tool carried thereby, with respect to said axis of rotation.

6. The combination defined in claim 1 wherein said inner shaft carries at said one end thereof a first toothed element and wherein said tool carrier means carries a second toothed element meshing with said first toothed element, said toothed element being so constructed and arranged that upon rotation of said inner shaft member relative to said outer shaft member said first toothed element imparts to said second toothed element such movement as will cause pivotal movement of said tool carrier means about said pivot axis.

7. The combination defined in claim 6 wherein said first toothed element is a gear having an annular rim and wherein said second toothed element is a sector-shaped element having an arcuate rim.


**References Cited** in the file of this patent

UNITED STATES PATENTS

| | | |
|---|---|---|
| 126,522 | Cooper | May 7, 1872 |
| 354,737 | Richards | Dec. 21, 1886 |
| 443,931 | Carnan | Dec. 30, 1890 |
| 485,233 | Smith | Nov. 1, 1892 |
| 495,656 | Beekman | Apr. 18, 1893 |
| 1,823,461 | Monckmeier | Sept. 15, 1931 |
| 2,112,396 | Corrigan | Mar. 29, 1938 |
| 2,286,217 | Martin | June 16, 1942 |
| 2,367,555 | Arney | Jan. 16, 1945 |
| 2,583,477 | Durler | Jan. 22, 1952 |

FOREIGN PATENTS

| | | |
|---|---|---|
| 274,728 | Germany | May 29, 1914 |
| 560,268 | Great Britain | Mar. 28, 1944 |