April 24, 1945. J. F. STANDISH 2,374,244

ROTARY ASSEMBLAGE

Filed April 14, 1944 2 Sheets-Sheet 1

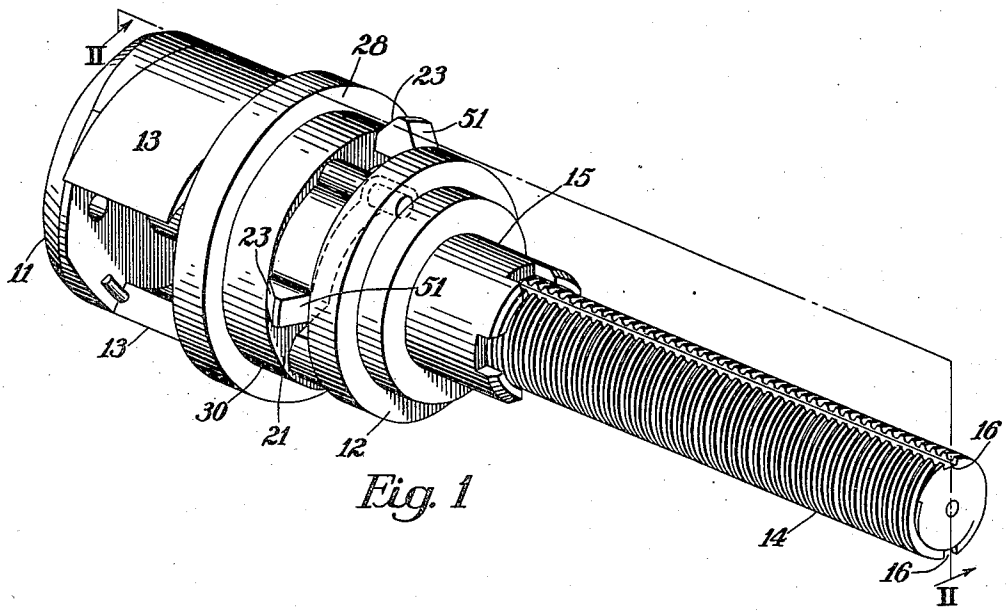


Fig. 1

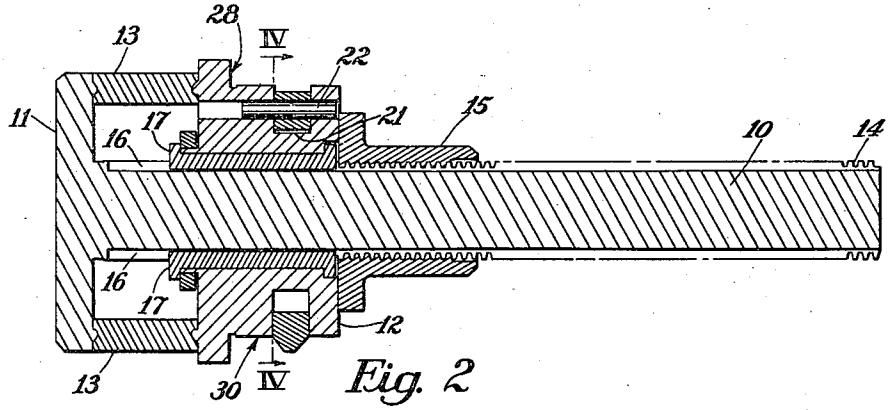


Fig. 2

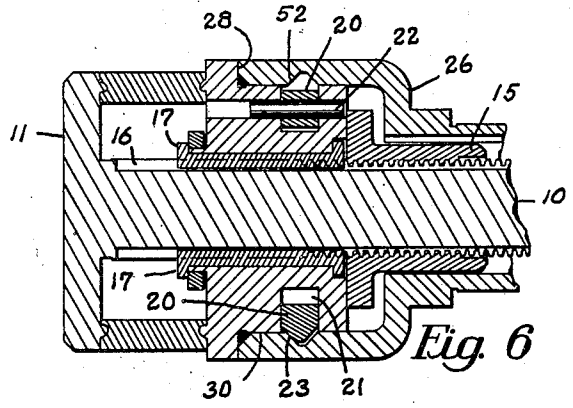
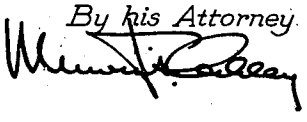


Fig. 6

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ROTARY ASSEMBLAGE

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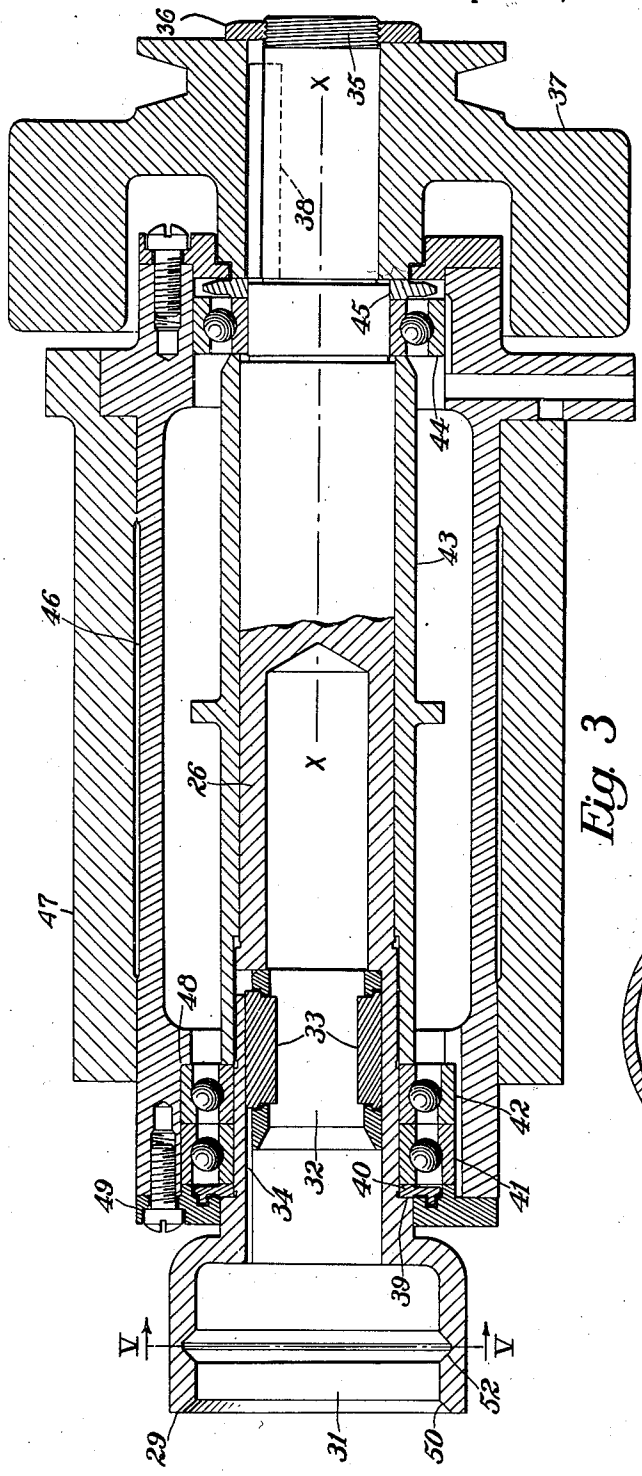


Fig. 3

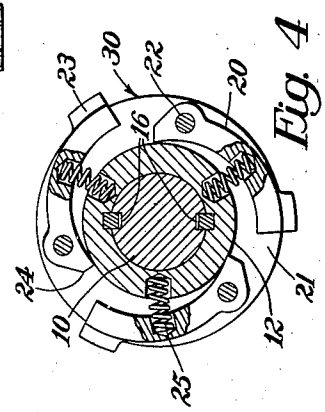


Fig. 4

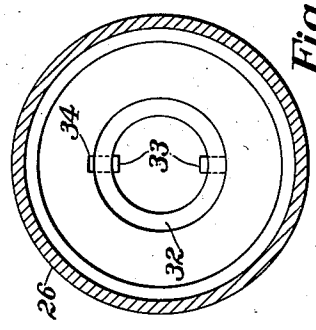


Fig. 5

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UNITED STATES PATENT OFFICE

2,374,244

ROTARY ASSEMBLAGE

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Application April 14, 1944, Serial No. 531,103

7 Claims. (Cl. 12—91)

The purpose of this invention is to provide automatic means for coupling separable units of a rotary assemblage in which centrifugal force may be utilized to secure the units in assembled relation and tighten them, one against the other. The invention is not limited to the use to which the rotary assemblage is to be put, but the embodiment herein set forth is designed to be applied to a heel-trimming machine.

In the course of a day's work in a shoe factory it may be necessary to remove the cutter-head of a heel-trimming machine many times, either to sharpen the cutting blades or to substitute other blades or other cutter-heads having blades of other form, according to the styles of the heels to be trimmed. In such machines heretofore provided it has been necessary to secure the cutter-heads with nuts and to use wrenches to tighten them. The present invention does away with nuts and wrenches for that purpose and provides coupling means that does not require any manipulation other than mounting or demounting the tool-carrying head, yet automatically secures the head in consequence of setting up rotation of the assemblage.

The illustrated embodiment includes a tool head and a rotary driven carrier therefor having telescopically related portions that provide for inserting one into the other with relative movement lengthwise of their axis of rotation, the carrier being a hollow shaft into which the shank and other elements of the tool head may be inserted. The separable units have coactive driving elements and coactive stop faces by which the endwise assembling movement of the head is arrested.

A feature of the invention is embodied in a plurality of latch members carried by the tool head and arranged to go inside the hollow shaft when the tool head is pressed home. These latch members are individually movable toward and from the axis of rotation and are provided with wedge faces that coact automatically with the interior of the hollow shaft to maintain the aforesaid stop faces one against the other. When the assemblage is in rotation, centrifugal force develops a wedging effect of the latch members to maintain the head against the stop face of the shaft.

The wedging faces are preferably pitched at an angle greater than the angle of repose to permit withdrawing the tool head from the shaft when the assemblage is not in rotation. Moreover, the latch members and the shaft are also preferably provided with coactive inclined faces arranged to deflect the latch members toward the rotational axis when the tool head is being inserted into the shaft, these faces being pitched oppositely with respect to the wedge faces that maintain the assembled relation.

Referring to the drawings,

Fig. 1 is a perspective view of a tool head constructed in accordance with the invention;

Fig. 2 is a longitudinal section of the tool head;

Fig. 3 is a longitudinal section of supporting means including a rotary carrier with which the tool head is adapted to be assembled in telescopic relation;

Fig. 4 is a cross section of the tool head in the plane of line IV—IV of Fig. 2;

Fig. 5 is a section of the rotary carrier in the plane of line V—V of Fig. 3; and

Fig. 6 is a fragmentary section of the tool head and its carrier in assembled relation.

The tool head comprises a cylindrical shank 10 having a flange 11, a collar 12 mounted on the shank and adjustable lengthwise thereof, cutting blades 13 between the flange and the collar, and other parts to be described. The shank is provided with a screw-thread 14 for a nut 15 by which the collar is forced toward the flange 11 to clamp the blades 13. Groves are formed in the blades to receive retaining ribs formed on the flange and collar, and grooves 16 are formed in the shank to receive splines 17 embedded in the bore of the collar.

The collar 12 carries three individually movable latch members 20 all nested in an annular peripheral groove 21 encircling its axis of rotation. The latch members are arranged in a circular series and are symmetrically spaced to preserve dynamic balance of the assemblage. The latch members and the collar are connected by pivot pins 22 all parallel with the axis of the shank 10. The longer and heavier ends of the latch members are portions of V-section provided with wedge faces 23, while the shorter ends 24 are arranged to engage the surface forming the bottom of the groove when the tool head is detached and thereby prevent the longer ends from projecting too far outside the periphery of the collar. Light springs 25 may be arranged to move the latch members to the positions represented in Fig. 4, but they are not necessary and could be omitted without affecting the invention.

Fig. 3 includes a rotatable hollow shaft 26 the bore 27 of which is adapted to receive the shank 10 of the tool head. The rotational axis of the hollow shaft is indicated by a line x—x. One end of the shaft is open to receive the shank 10 and that portion of the collar 12 in which the latch

members are located. Another portion of the collar is too large to enter the shaft and is provided with a stop face 28 arranged to abut a stop face 29 on the shaft to arrest inward movement of the tool head. When the tool head and the shaft are assembled the peripheral surface 30 of the collar is centered by the internal surface 31 of the shaft, while the shank 10 engages a bushing 32 and is centered thereby. This bushing is pressed tightly into the shaft and is provided with tongue elements 33 arranged to coperate with the grooves 16 in the shank to drive the tool head. One of the tongue elements is interlocked with the hollow shaft which is provided with a groove 34 for that purpose.

The other end of the hollow shaft has a screw-thread 35 on which a nut 36 is screwed to secure a series of elements including a pulley 37. A driving belt may run on the pulley to drive it at high speed. The pulley and the shaft are otherwise connected by a key 38. The shaft is provided with a shoulder 39 to sustain the end thrust due to tightening the nut 35 against the pulley, but the space between the shoulder and the pulley is occupied by an oil ring 40, ball bearings 41 and 42, a sleeve 43, a ball bearing 44 and another oil ring 45, all of which surround the shaft.

The ball bearings are seated in a fixed supporting sleeve 46 secured to a frame 47. This sleeve provides an oil chamber for lubricating the bearings and it also prevents end shake of the bearings 41, 42 which, in turn, prevent end shake of the shaft 26. For the latter purpose the sleeve 46 is provided with a shoulder 48 against which the outer ballrace of the bearing 42 is maintained by the outer race of bearing 41 and a header 49 fastened to the sleeve.

The open end of the shaft 26 is beveled to provide an internal inclined surface 50 arranged to contract those portions of the latch members 20 that normally project beyond the surface 30 of the collar 12. This feature facilitates the process of inserting the collar into the shaft in that it deflects the latching portions of the members 20 toward the axis of the shaft far enough to permit the stop face 28 of the collar to abut the stop face 29 of the shaft. The latch members are provided with inclined faces 51 arranged to coact with the surface 50.

For the purpose of securing the detachable tool head against accidental removal, the shaft 26 is provided with an internal frusto-conical wedge face 52 arranged to coact with the wedge faces 23 of the latch members. As shown in Fig. 3, the face 52 is one wall of an annular groove of V-section. Its angle of inclination, likewise that of the coacting wedge faces 23, is greater than the angle of repose to deflect the latching elements toward the axis of the shaft in consequence of withdrawing the tool head from the shaft. On the other hand, when the tool head and the shaft are fully assembled and in rotation centrifugal force develops a high degree of radial pressure of the wedge faces 23 against the wedge face 52. The inclination of these faces translates the effect of centrifugal force into axial thrust by which the pressure of the stop face 28 against the stop face 29 is increased as the speed of rotation accelerates and is maintained so long as rotation continues. Since the shaft 26 is constrained against end shake, and since the wedge faces and the stop faces eliminate relative end shake of the tool head and the shaft, the tool or tools affixed to the head will be restrained against movement lengthwise of the axis $x - x$ so long as the speed of rotation is sufficient to maintain pressure of the latching elements against the wedge face 52.

When the shaft is not in rotation the tool head may be detached simply by withdrawing it endwise. When the latch members are out of the shaft their ends 24 and the coacting surface of the collar 12 will maintain their latching ends within a circle that will enable the deflecting surface 50 in the mouth of the shaft to contract them incidentally to installing the tool head.

Having described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. In a machine for performing an operation with a rotary tool, a rotatable hollow shaft, means for driving the shaft at high speed, bearing means in which the shaft is journaled and constrained against end shake, a tool-carrying head having a shank telescopically related to the shaft, the head and the shaft having cooperative tongue-and-groove portions for driving the head and cooperative stop faces for arresting inward movement of the head, and a plurality of individually movable latch members carried by the head and arranged to go inside the shaft, the latch members and the shaft having cooperative wedge faces and the latch members being responsive to centrifugal force to maintain wedging effect of said faces in consequence of rotating the assemblage about the axis of the shaft, and said wedge faces being arranged to maintain said stop faces one against the other.

2. An assemblage comprising the subject matter of claim 1 in which the inclination of said wedge faces is greater than the angle of repose to deflect the latch members toward the axis of the shaft in consequence of withdrawing the head from the shaft.

3. An assemblage comprising the subject matter of claim 1 in which the shaft and the latch members also have faces arranged to coact while the latch members are being inserted into the shaft, these faces being inclined to deflect the latch members toward the axis of the shaft.

4. An assemblage comprising the subject matter of claim 1 in which the head is provided with an annular peripheral groove encircling its axis of rotation, and the latch members are arranged in a circular series in said groove and symmetrically spaced to preserve dynamic balance of the assemblage.

5. An assemblage comprising the subject matter of claim 1 in which an internal frusto-conical surface on the shaft constitutes the wedge face with which the latch members coact to maintain the stop faces one against the other.

6. An assemblage comprising the subject matter of claim 1 in which the shaft is provided with an internal annular groove of V-section encircling its axis, and in which the latch members have portions of V-section arranged to go into said groove and engage one wall thereof to develop the edging effect, and pivots connecting the head and the latch members to constrain the latching movements of the latter.

7. In a machine for performing an operation with a rotary tool, a male unit and a female unit having telescopically related portions, one being a tool head and the other a rotatable carrier adapted to be assembled and separated with simple endwise movement of the tool head along its rotational axis, bearing means in which the

carrier unit is journaled and constrained against end shake, means for driving the carrier unit at high speed, said units having cooperative stop faces for arresting assembling movement and cooperative faces for driving the tool head, and a plurality of individually movable latch members responsive to centrifugal force derived from rotation about said axis, said members being carried by the male unit, the latch members and the female unit having cooperative wedge faces arranged to maintain pressure of said stop faces one against the other in consequence of centrifugal force derived as aforesaid.

JOHN F. STANDISH.