United States Patent [19]

Abarotin et al.

[11] **3,718,064**

[45] **Feb. 27, 1973**

[54] **APPARATUS FOR ADJUSTMENT OF SIDE TRIMMER KNIFE**

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[73] Assignee: **United States Steel Corporation**

[22] Filed: **Jan. 21, 1971**

[21] Appl. No.: **108,489**

[52] **U.S. Cl.** .....**83/502,** 33/164 B, 83/522

[51] **Int. Cl.** **B23d 19/04,** B26d 1/24

[58] **Field of Search**.....83/499, 504, 500, 501, 502, 83/700, 522; 33/164 B, 165; 143/174 B

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[57] **ABSTRACT**

Apparatus consists of a differentially threaded sleeve surrounding and in threaded engagement with an adjustment rod which in turn is connected with an axially adjustable side trimmer knife-mounting in a side trimmer housing. An elongated nut, which is restrained from axial movement, is circumferentially mounted around the sleeve in threaded engagement therewith. Means are provided for selectively restraining the sleeve from axial movement relative to the adjustment rod during rotation of the sleeve. This permits the adjustment rod to move axially at a relatively high rate for coarse adjustment of the side trimmer knife. When the sleeve is free of axial-movement restraint during rotation, it moves axially in one direction while the adjustment rod moves axially in the opposite direction depending upon the direction of rotation of the sleeve. This causes the adjustment rod to move at a relatively low rate for fine adjustment of the side trimmer knife. The fine adjustment rate of movement is equal to the difference between the rate of axial movement of the sleeve and the rate of axial movement of the adjustment rod.

5 Claims, 5 Drawing Figures

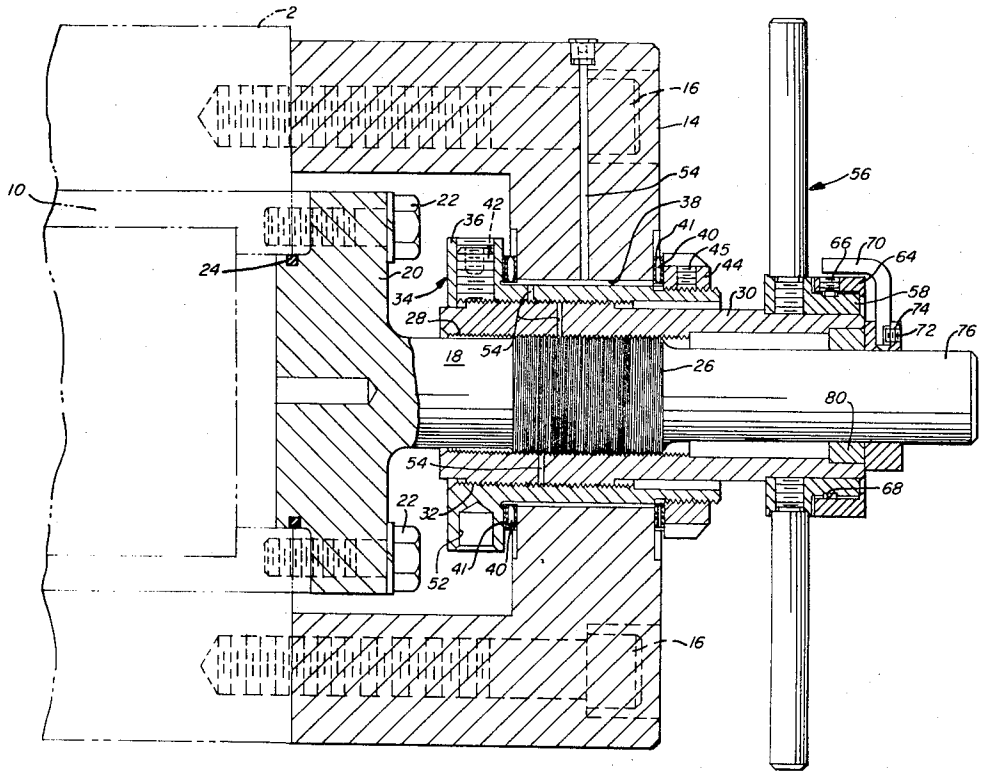

FIG. 1

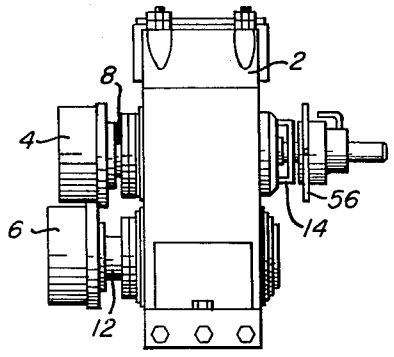

FIG. 3

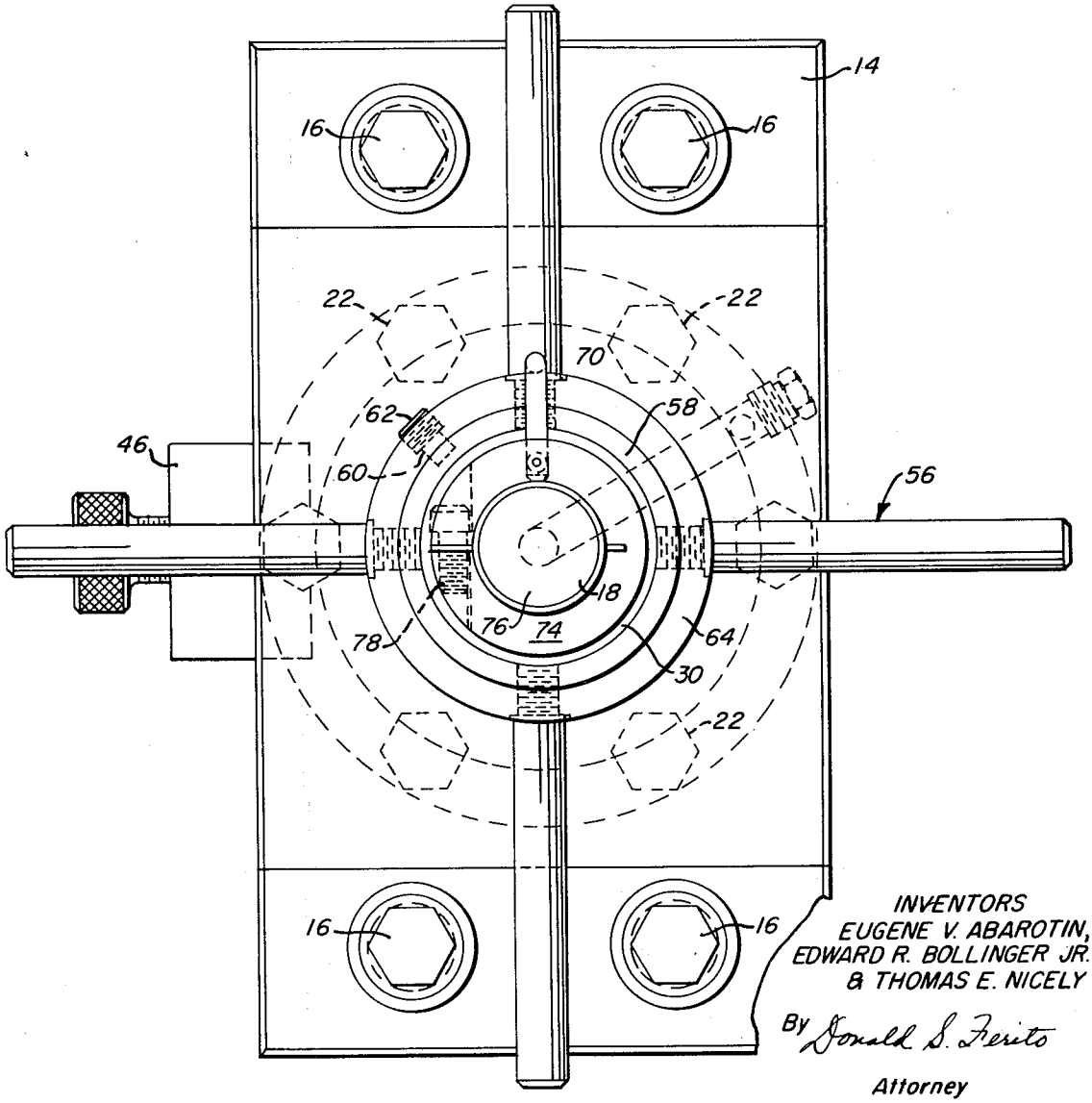

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FIG. 2

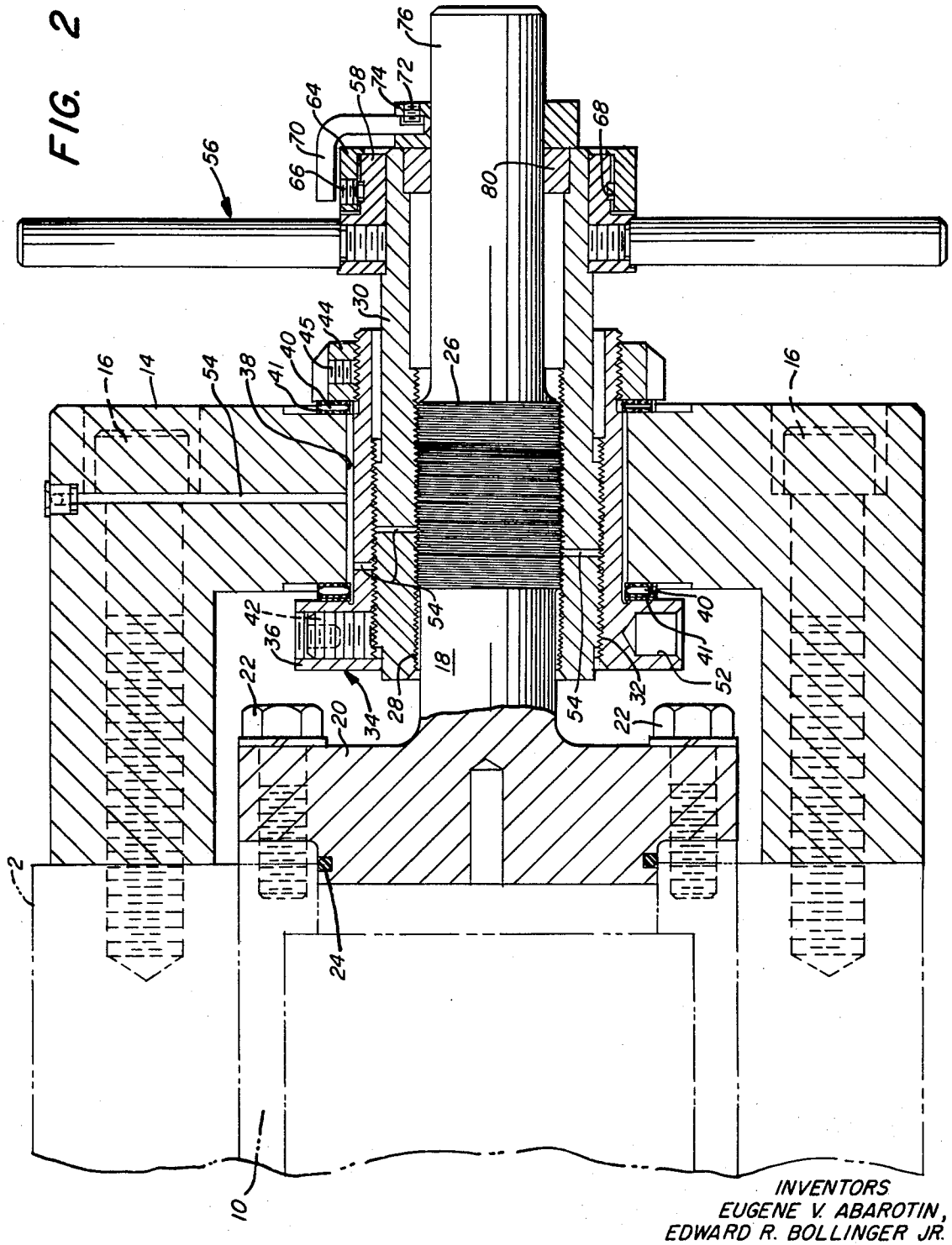

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FIG. 4

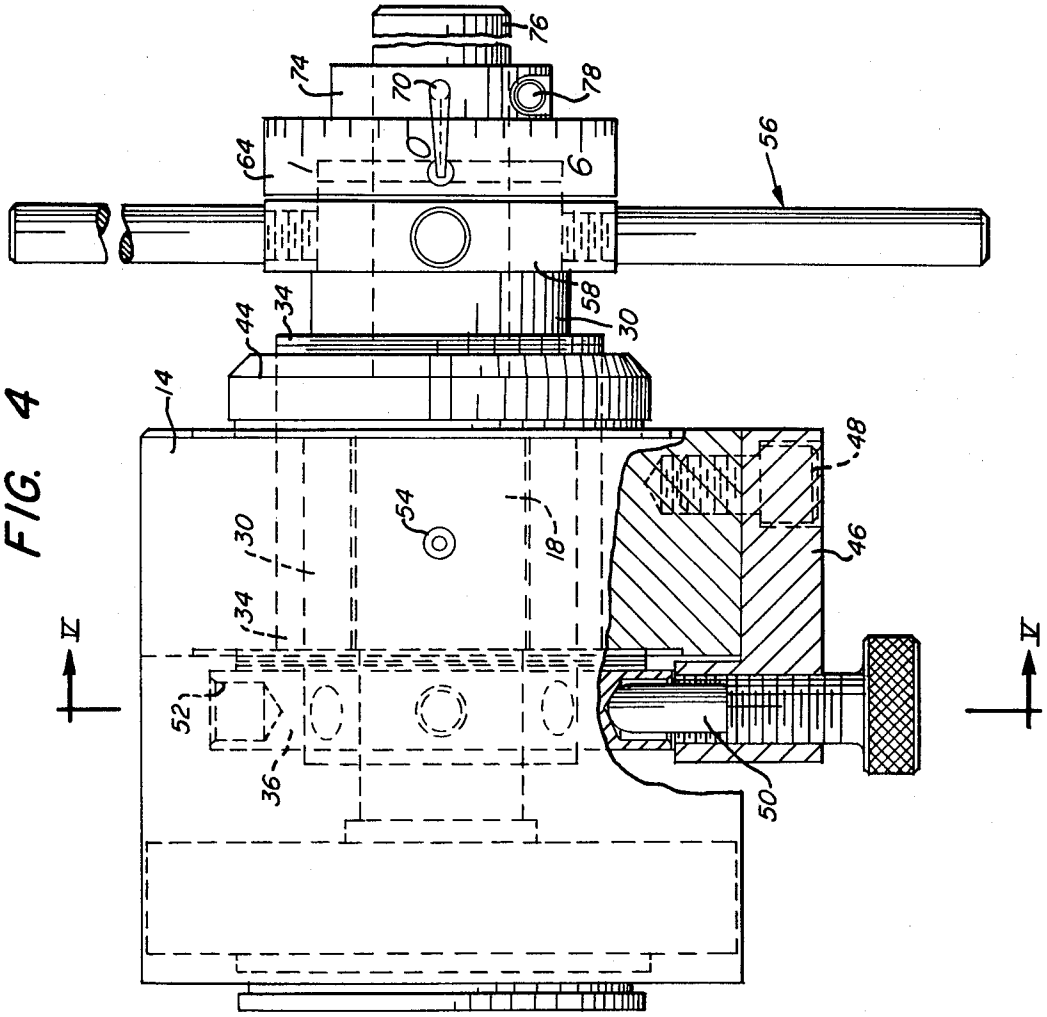
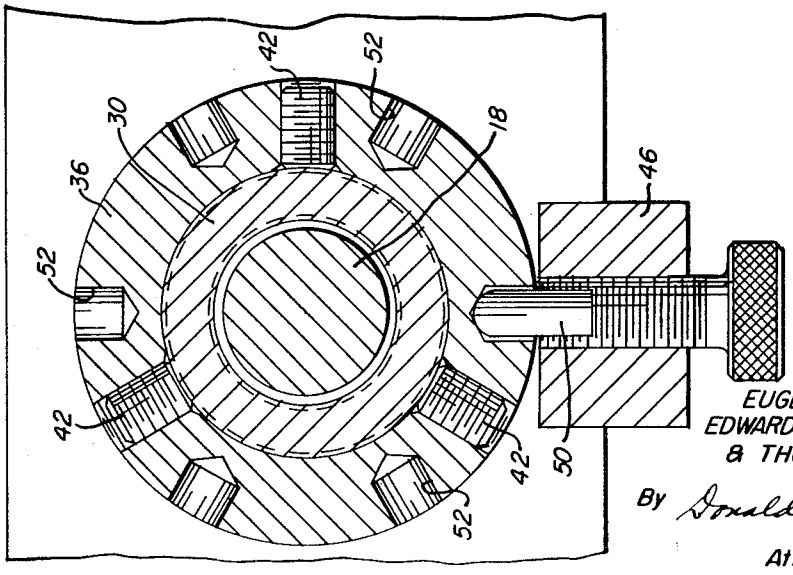


FIG. 5



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APPARATUS FOR ADJUSTMENT OF SIDE TRIMMER KNIFE

BACKGROUND OF THE INVENTION

The invention relates generally to side trimmers and more particularly to an improved apparatus for axially adjusting one side trimmer knife relative to another.

Prior to our invention, it was usual practice when axially adjusting a side trimmer knife to make the adjustment by either advancing or backing off nuts located on each side of a yoke through which a horizontal stud passes. The stud was attached to the knife shaft assembly by means of a bolted flange. However, when adjusting side trimmer knives in this manner it was not possible to obtain a quick and precise adjustment during operation of the side trimmer. A quick adjustment was needed for continuous high quality trimming and long knife life.

It is, accordingly, the primary object of our invention to provide an improved apparatus for easily and quickly making adjustments of side trimmer knives during operation of a side trimmer.

As a corollary to the above object, it is a more specific object of our invention to provide apparatus as set forth in the above object which includes an adjustment rod connected with the mounting structure of a side trimmer knife in a side trimmer housing, a differentially internally and externally threaded sleeve rotatably disposed around the adjustment rod in threaded engagement therewith, means for rotating the sleeve, a nut fixed against axial movement surrounding the sleeve in threaded engagement therewith, and means for selectively restraining the sleeve from axial movement when rotating relative to the rod so that coarse adjustment of the trimmer knife is obtained; when the sleeve is rotated free of axial restraint, fine adjustment of the knife is obtained when the sleeve is rotated.

As a corollary to the above object, it is another object of our invention to provide apparatus as set forth in the above object which includes index and coacting indicating means which indicate the amount of lateral displacement between an adjustable and a fixed side trimmer knife.

These and other objects will become more apparent after referring to the following specification and attached drawing, in which:

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a side elevational view of a portion of a side trimmer shear, the adjustable side trimmer knife of which is mounted with the apparatus of our invention;

FIG. 2 is a vertical sectional view of the apparatus of our invention;

FIG. 3 is an elevational view looking at the right side of FIG. 2;

FIG. 4 is a plan view; and

FIG. 5 is a sectional view taken substantially along the line V—V of FIG. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring more particularly to the drawing, reference numeral 2 designates generally a side trimmer housing having an adjustable side trimmer knife 4 and a fixed side trimmer knife 6 rotatably mounted therein. Side trimmer knife 4 is carried by a stub shaft 8 which is rotatably mounted in bearings (not shown) which are in turn mounted in an axially adjustable bearing box 10 within the housing 2. Fixed side trimmer knife 6 is mounted on a stub shaft 12 which may be rotatably mounted in any conventional suitable manner.

Referring more particularly for the time being to FIGS. 1 and 2, a yoke 14 is secured to the side of the housing 2 opposite the adjustable knife 4 by means of bolts 16. An adjustment rod 18 having a flange 20 at one end is attached to the bearing box 10 by means of bolts 22. The flange 20 may be sealed by an O-ring 24 made of rubber or similar material. The adjustment rod 18 is formed with circumferential threads 26 intermediate its ends which are in engagement with the internal threads 28 of a differential screw which is in the form of a differentially externally and internally threaded sleeve 30. Internal threads 28 of the sleeve 30 differ in size from the external threads 32 on the sleeve. For purposes of this description, it will be assumed that internal threads 28 are 18 size, i.e., 18 threads per inch and threads 32 are 16 size, i.e., 16 threads per inch. It will be understood that the internal and external threads may be of any desired size so long as the sizes are different. The reason for the differential threading will become apparent hereinafter.

An elongated nut 34 having a circumferential flange 36 at one end surrounds and is in threaded engagement with the sleeve 30. The assembly of nut 34, sleeve 30 and adjustment rod 18 pass through an opening 38 in the yoke 14.

Needle bearing 40 and hardened washers 41 are located on the inside and outside of the yoke 14 adjacent the opening 38 and the nut 34. Nut 34 is normally rotatable in the bearings 40.

Three nylon set screws 42 are disposed in the flange 36 on the end of the nut 34 to provide a locking connection between the nut 34 and the sleeve 30.

A nut 44 is threaded on the outwardly projecting end of the nut 34 seated against the outer hardened washers 41 on the outside of the yoke 14. The nut 44 on the outer end and the flange 36 on the inner end of nut 34 prevent lateral movement of the nut 34. Nut 44 may be locked in position by means of a nylon set screw 45.

As best shown in FIGS. 4 and 5, a locking pin support 46 is attached to the yoke 14 by means of bolts 48. The pin support 46 is a housing for a threaded locking pin 50 which is adapted to engage any one of a plurality of holes 52 in flange 36 on the end of the nut 34 to prevent rotation of the nut 34 relative to the sleeve 30 during fine adjustment of the knife 4, as will be more fully explained hereinafter.

Lubricating holes 54 may be provided in the yoke 14, nut 34, and sleeve 30, as best shown in FIG. 2.

A hand wheel, generally designated by reference numeral 56, having a flanged hub 58 is secured to the projecting end of the sleeve 30 by means of a square key 60 secured in place by a set screw 62 located in the hub 58 of the wheel 56.

An index dial 64, whose face may be divided into seven major divisions and each major division divided into five minor divisions, is attached circumferentially to the hub 58 of the wheel 56 and is secured by means

of a half dog set screw **66**, the end of which is received in a circumferential groove **68** extending around the hub **58**. An indicator pointer **70** which extends over the index dial **64** is attached by means of a set screw **72** in a half-split locking collar **74** which is normally clamped on the end **76** of adjustment rod **18** which projects outwardly of the outward end of the sleeve **30**. The collar **74** is disposed adjacent the end of the sleeve **30**. A bolt **78** secures the locking collar **74** around the adjustment rod **18**.

The sleeve **30** may be provided with an internally disposed ring bearing **80** of bronze or similar material which slides along rod **18** to provide support.

In operation, the locking pin **50** is threaded out of the hole **52** in the flange **36** and the sleeve **30** is rotated by means of the hand wheel **56**. This causes the nut **34** and sleeve **30** to rotate as a unit about the adjustment rod **18** which cannot rotate due to its attachment to the bearing box **10**. However, the adjustment rod **18** together with bearing box **10** can move laterally relative to the sleeve **30** either to the right or the left, depending on the direction of rotation of sleeve **30**, when the sleeve is rotated. When the nut **34** and sleeve **30** are locked together and rotating as a unit around the rod **18**, the sleeve **30** cannot move axially with the result that the rod **18** translates axially one-eighteenth or 0.055 inch with each revolution of the sleeve **30** since the internal threads **28** thereof and the threads on the adjustment rod **18** which are in threaded engagement are **18** size. This arrangement provides coarse adjustment of the adjustable side trimmer knife **4**. During coarse adjustment, the locking collar **74** is not affixed to the rod **18**. The coarse adjustment is continued until there is zero lateral clearance between the adjustable side trimmer knife **4** and the fixed side trimmer knife **6**.

After the zero clearance point has been reached through coarse adjustment, the hand wheel **56** is backed-off until locking pin **50** is aligned with the nearest hole **52** in the flange **36** and the locking pin is inserted in the hole to prevent rotation of the nut **34** relative to the sleeve **30**. Since the nut **34** is now fixed against rotation and the adjustment rod **18** cannot rotate but only translate, rotation of the sleeve **30** by means of wheel **56** produces a relative axial motion between the sleeve **30** and the adjustment rod **18**. Since the external threads on sleeve **30** are size **16**, the sleeve translates one-sixteenth or 0.062 inch in one direction with each complete revolution of the wheel **56** while adjustment rod **18**, which is in threaded engagement with the size **18** internal threads of the sleeve **30**, will move one-eighteenth or 0.055 inch in the opposite direction at the same time. Therefore, the resultant rate of travel of the adjustment rod **18** is the difference between 0.062 and 0.055 or 0.007 inch per complete revolution of the hand wheel **56**. This provides fine adjustment of the adjustable knife **4** relative to the fixed knife **6**.

The hand wheel **56** is then rotated until there is again zero clearance between the two knives. The locking collar **74** is then clamped into position abutting the end of the sleeve **30**. The set screw **66** is now loosened and the index dial **64** is set so that the zero marking is under the indicator pointer **70**. Fine adjustment is then continued until the desired clearance between the two knives is achieved. The operator can make the adjustment any time necessary without shutting down the side trimmer. He can also determine the amount of clearance by reading the index dial.

While we have shown but one embodiment of our invention, other adaptations and modifications may be made without departing from the scope of the following claims.

We claim:

1. In a side trimmer including a housing, a mounting structure in said housing, a first side trimmer knife rotatably mounted in said mounting structure, a second side trimmer knife mounted in said housing for coaction with said first side trimmer knife, the improvement therewith of apparatus for laterally adjusting said mounting structure to axially adjust said first side trimmer knife relative to said second side trimmer knife, said apparatus comprising an adjustment rod connected with said mounting structure, differential screw means in threaded engagement with said adjustment rod for relative axial and rotational movement therewith, means for rotating said screw, a nut in threaded engagement with said screw, said nut being fixed against axial movement, rotation of said differential screw effecting axial movement of said adjustment rod, means engaging said screw for selectively preventing axial movement thereof during rotation thereof, rotation of said screw free of axial restraint effecting relative axial movement between said screw and said adjustment rod and fine adjustment of said first side trimmer knife relative to said second side trimmer knife, and rotation of said screw under axial restraint effecting axial movement of said rod and coarse adjustment of said first side trimmer knife relative to said second side trimmer knife.

2. Apparatus as defined by claim **1** in which said differential screw is in the form of an internally and externally threaded sleeve, the threads on the interior of said sleeve and the threads on the exterior thereof being of different size, said adjustment rod being threaded in said sleeve whereby rotation of said sleeve effects axial movement of said rod relative to said sleeve.

3. Apparatus as defined by claim **2** in which the end portion of said rod remote from said mounting structure projects outwardly of said sleeve and said screw rotating means is a wheel having a hub flange circumferentially mounted around the end of said sleeve adjacent the projecting end of said adjustment rod, index markings on said hub flange, indicator means on the projecting end of said adjustment rod coacting with said index markings to indicate the amount of relative rotation of said sleeve around said adjustment rod.

4. Apparatus as defined by claim **3** including a ring mounted for circumferential adjustment around the end of said sleeve adjacent the projecting end of said adjustment rod, said index markings being on said ring, means for securing said ring in adjusted position on said sleeve.

5. In a side trimmer including a housing, a mounting structure in said housing, a first side trimmer knife rotatably mounted in said mounting structure, a second side trimmer knife mounted in said housing for coaction with said first side trimmer knife, the improvement therewith of apparatus for laterally adjusting said mounting structure to axially adjust said first side trimmer knife relative to said second side trimmer

knife, said apparatus comprising an adjustment rod connected with said mounting structure, differential screw means in threaded engagement with said adjustment rod for relative axial and rotational movement therewith, said differential screw means being in the form of an internally and externally threaded sleeve, the threads on the interior of said sleeve and the threads on the exterior thereof being of different size, said adjustment rod being threaded in said sleeve whereby rotation of said sleeve effects axial movement of said rod relative to said sleeve, means for rotating said sleeve, the end portion of said rod remote from said mounting structure projecting outwardly of said sleeve, said means for rotating said sleeve comprising a wheel having a hub flange circumferentially mounted around the end of said sleeve adjacent the projecting end of said adjustment rod, index markings on said hub flange, indicator means on the projecting end of said adjustment rod coacting with said index markings to indicate the amount of relative rotation of said sleeve around said adjustment rod, a nut in threaded engagement with said sleeve, said nut being fixed against axial movement, rotation of said differential sleeve effecting axial movement of said adjustment rod, means engaging said sleeve for selectively preventing axial movement thereof during rotation thereof, rotation of said sleeve free of axial restraint effecting axial movement between said sleeve and said adjustment rod and fine adjustment of said first side trimmer knife relative to said second side trimmer knife, and rotation of said sleeve under axial restraint effecting axial movement of said rod and coarse adjustment of said first side trimmer knife relative to said second side trimmer knife, and a clamping ring removably mounted on the projecting end of said adjustment rod abutting the end of said sleeve when said sleeve is in a predetermined position, said indicator means being mounted on said clamping ring and extending to said index markings.

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