Dec. 6, 1960 H. S. WALTHER 2,963,060

ADJUSTABLE CUTTER HEAD

Filed April 7, 1959

Fig. 1

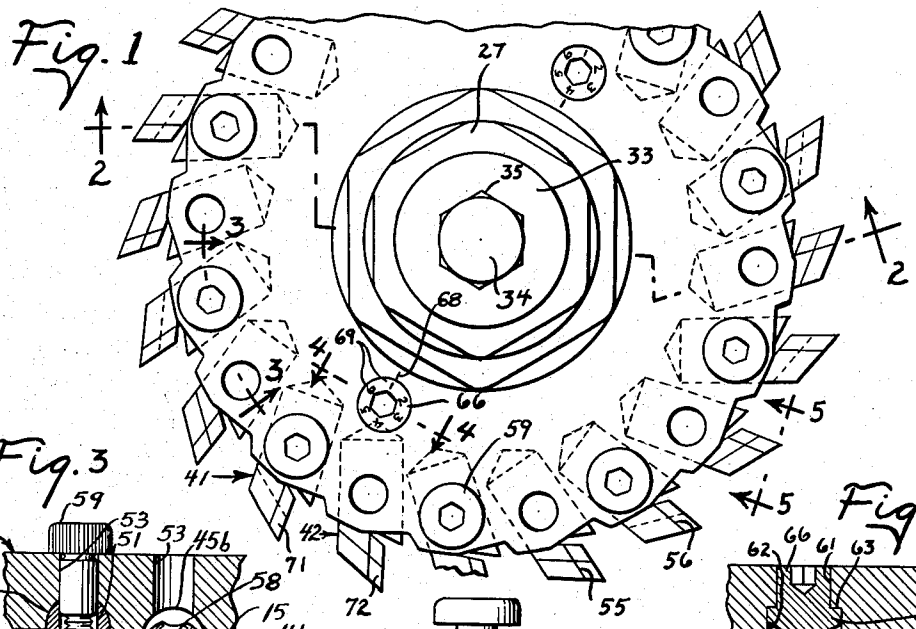


Fig. 3

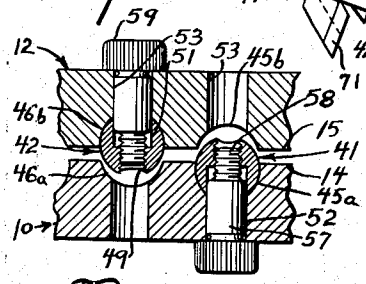


Fig. 4

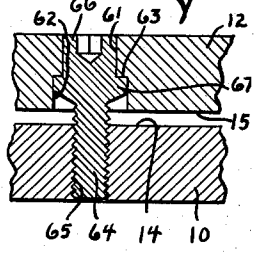


Fig. 5

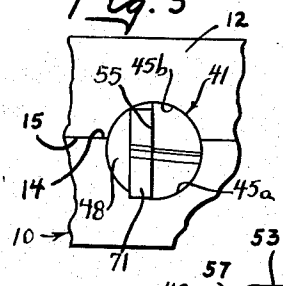
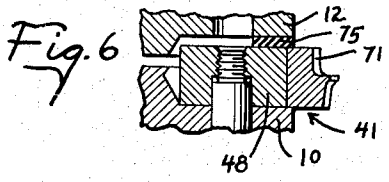


Fig. 2

Fig. 6



Inventor

Harry S. Walther

By McCanna, Morsbach & Pillote

Atty's

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ADJUSTABLE CUTTER HEAD

Harry S. Walther, Beloit, Wis., assignor to Robert H. Solem, d.b.a. Wisconsin Knife Works, Beloit, Wis.

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11 Claims. (Cl. 144—218)

This invention relates to a cutter head and particularly to an expansion type cutter head for use in woodworking machinery and the like.

An important object of this invention is to provide an expansion type cutter head of the type having a pair of tool supporting plates which are adjustable toward and away from each other and which has an improved arrangement for detachably supporting the cutting tools on the plates to more accurately and firmly hold the tools in position to enable form grinding of the tools before assembly on the head.

Another object of this invention is to provide an expansion type cutter head having an improved arrangement for selectively adjusting in known increments the spacing between the tool support plates and the sets of tools carried thereby.

An important feature of the present invention resides in the provision of an expansion type cutter head including a pair of tool supporting plates, which plates have bores extending inwardly from the periphery thereof at the interface between the plates to provide complementary semi-cylindrical sockets in the registering faces of the plates and in which the cutting tools have cylindrical body portions disposed in the sockets and non-slidably and non-rotatably secured to the plates.

These, together with various ancillary objects, features and advantages of the present invention will be more readily appreciated as the same becomes better understood by reference to the following detailed description when taken in connection with the accompanying drawings wherein:

Figure 1 is a fragmentary top plan view of the cutter head;

Fig. 2 is a longitudinal sectional view taken on the plane 2—2 of Figure 1;

Fig. 3 is a fragmentary sectional view taken on the plane 3—3 of Figure 1;

Fig. 4 is a fragmentary sectional view taken on the plane 4—4 of Figure 1;

Fig. 5 is a fragmentary side elevational view showing one of the cutters mounted in the head, and taken on the plane 5—5 of Figure 1; and

Fig. 6 is a fragmentary sectional view illustrating a modified cutter head.

As best shown in Fig. 2, the expansion cutter head includes a lower annular support plate **10** having an integral upstanding sleeve **11** thereon and an upper annular support plate **12** having an integral upstanding sleeve **13** adjacent its inner periphery. The sleeve **13** surrounds the sleeve **11** and is slidable thereon to permit adjustment of the plates **10** and **12** toward and away from each other between a position in which the adjacent faces **14** and **15** of the plates **10** and **12** are in abutting contact, as shown in Fig. 5, to a position in which the plates are spaced relatively far from each other.

Provision is made for adjustably mounting the head on a drive sprindle **18**. For this purpose, the bore **19** in the sleeve **11** is beveled at its lower end, as indicated at

21, and the upper end of the sleeve **11** is counterbored at **22** to provide a beveled shoulder **23** at a point intermediate the ends of the sleeve **11**. An expansible sleeve **24** is disposed within the bore **19** and has a flared portion **24***a* at its lower end cooperable with the beveled portion **21** in the bore. A split collar **26** extends around the expansible sleeve **24** intermediate its ends and is receivable in the counterbore **22**. The lower end of the collar is tapered as indicated at **26***a* and a nut **27** is threaded on tne upper end of the expansible sleeve and engages the collar to press the collar **26** downwardly relative to the sleeve **24** whereby the beveled portions **26***a* on the collar and the flared portion **24***a* on the sleeve cam the expansible sleeve inwardly into snug engagement with the drive spindle **18**. A key **29** is carried by the expansible sleeve **24** and extends into guideways **31** and **32** in the spindle and sleeve **11** respectively, to constrain the sleeve against rotation relative to the spindle. Advantageously, a cap **33** may be provided on the upper end of the expansible sleeve **24** and an adjusting screw **34** and nut **35** are mounted on the cap to engage the upper end of the spindle **18** and thereby facilitate accurate positioning of the cuter head on the spindle.

Expansion heads are particularly designed for the forming of tongue and grooved lumber and include first and second sets of cutter heads designated generally by the numerals **41** and **42** respectively mounted on the plates **10** and **12**. The cutting tools extend outwardly of the pheriphery of the plates and are adjustable with the respective plates to vary the width of the tongue or groove formed thereby in the wood. The configuration of the blades of the tools will vary widely dependent upon the particular shape of the edge to be formed on the board. The specific blades shown in Fig. 2, are arranged to form a tongue edge on the board designated generally by the numeral **43**. The blade portions of the tools **41** and **42** move in relatively overlapping paths, and the first set of tools **41** are shaped to form the underside of the bead **43***a* and the edge of the board below the bead while the other set of tools **42** are shaped to form the upper side of the bead and the edge of the board above the bead. As is apparent, by axially adjusting the plates **10** and **12** relative to each other, the cutter tools **41** and **42** can be adjusted to vary the width of the bead **43***a*.

The cutter tools are detachably mounted on the plates **10** and **12** and, in accordance with the present invention, first and second sets of bores designated **45** and **46** are formed in the plates **10** and **12**, at the interface thereof, and, as shown in Figure 1, the axes of the bores are inclined in the direction of rotation of the head. Each of the bores **45** and **46** extend in part in the plates **10** and **12** to form complementary semicylindrical sockets **45***a* and **45***b*, and **46***a* and **46***b*. Preferably, the axes of the bores **45** are disposed parallel to and laterally offset below the side **14** of the plate **10** a distance less than the radius of the bores so as to provide a major semicylindrical socket **45***a* in the plate **10** and a minor semicylindrical socket **45***b* in the plate **12**. Similarly, the axes of the bores **46** are also preferably laterally offset from the face **15** of the plate **12**, to provide a major semicylindrical socket **46***b* in the plate **12** and a minor socket **46***a* in the plate **10**. Since the bores simultaneously form the complementary semi-cylindrical sockets in the plates **10** and **12**, accurate registration of the sockets on these plates is assured.

The cutter tools **41** and **42** are similarly formed except for the particular shape of the cutter tip, and each includes a cylindrical body portion **48** which is adapted to be snugly received in the bores **45** and **46** so that, when the plates **10** and **12** are in abutting engagement as shown in Fig. 5, the plates snugly surround the body portions of the cutter tools. Provision is also made for

detachably securing the body portions of the cutter tools in the sockets, and in such a manner as to accurately locate the cutter tools radially on the expansible head, and also prevent axial and rotary movement of the cutter tools relative to the head. For this purpose a transverse bore is formed in each of the body portions **48** and is threaded at one end, as indicated at **49**. The other end is counterbored as indicated at **51** to provide an enlarged smooth guide bore in each of the cutter tools. The plates **10** and **12** have holes **52** and **53** respectively drilled therein, which holes intersect the bores **45** and **46** and have a diameter equal to the diameter of the counterbores **51** in the cutter tools. A plurality of cap screws are provided for securing the tools to the respective plates and each includes a shank portion **57** which is snugly received in the holes **52** and **53** and counterbores **51**, a threaded end portion **58** adapted to threadedly engage the tapped bore **49** in the cutter tool, and a head **59** which overlies the respective plate whereby to firmly draw the cutter tools into the sockets in the heads, when the cap screws are tightened. Preferably, the cutter tools **41** are located in the major semi-cylindrical sockets **45***a* in the plate **10** and the tools **42** are located in the major semi-cylindrical sockets **46***b* in the plate **12** so that the plates **10** and **12** surround the respective cutter tools throughout an arc somewhat greater than 180 degrees. This firmly supports the cutter tools on the respective plates and, as will be noted, the cap screws accurately locate the tools radially on the head and prevent axial shifting or rotation of the cylindrical tools relative to the head. Further, since the complementary semi-cyclindrical sockets in the plates **10** and **12** are at all times in accurate registry, the plates can be moved close together and even into abutting contact when necessary to provide the desired width of the tongue or groove formed by the cutters.

The above-described construction enables the cutters to be easily removed for interchanging different shaped cutters. Moreover, this construction facilitates the use of hard tips on the cutters, such as carbide tips designated **71** and **72**. For this purpose, the outer ends of each of the cutting tools **41** and **42** may be shaped to form a supporting face **55** and **56** respectively to which the hard tip is attached, as by brazing or silver solder. The cutting tips of the tools are form ground before mounting the tools on the head. This is achieved by mounting the tools of each set on a jig, with the tools arranged in a row and at the proper angle to permit simultaneous form grinding of all of the tools in the set. In this regard it is to be noted that the cap screws enable accurate location of the cutter tools in the jig as well as on the head so that, when the tools are thereafter inserted into the head, the cutting edges of the tools of each set will be in proper alignment. When the cutters become dull due to use, the cutter tools may be sharpened in the head by grinding the flat faces of the carbide tips **71** and **72**.

Provision is also made for accurately adjusting the spacing between the cutter tools in small increments. For this purpose, one of the plates such as **12** is formed with several annularly spaced bores **61** located radially inwardly of the periphery thereof and extending parallel to the axis of the plate. The bores are counterbored at **62** to provide a downwardly facing shoulder **63**. Adjusting screws **64** are threaded into a tapped bore **65** in the lower plate **10** and include a head portion **66** which is supported in the bore **61** and has a flange **67** thereon engageable with the shoulder **63**. The adjusting screws will force the plates **10** and **12** apart, when the screws are turned in one direction, and a lock nut **73** is threaded on the upper end **74** of the inner sleeve **11** and engages the upper end of outer sleeve **13** to move the plates towards each other and lock the plates in adjusted position. Conveniently, the heads **66** of the adjusting screws may be graduated in accordance with the lead of the threads **65** to correlate the angular movement of the screws with the separation of the plates **10** and **12**. As shown, angularly spaced indicia **69** are provided on the heads **66** and cooperate with a mark **68** on the plate **12**.

The relative axial spacing between the cutter tools **41** and **42** is roughly adjusted before starting the cutting operation, as required to form a preselected edge on the work piece **43**. Thereafter, small adjustments are made in the spacing between the plates **10** and **12** by measuring the cut edge of the work piece and making the necessary correction. In order to prevent the entrance of chips between the plates which might interfere with the final adjustment of the cutters, a resilient ring **75** (see Fig. 6) may be interposed between the registering faces of the plates, adjacent the periphery of the head. The resilient ring respectively underlies and overlies the cutter tools **42** and **41** at the outer periphery of the head, and may be inserted between the plates after the initial adjustment of the spacing therebetween. The size and resilience of the ring is selected so that the ring will deform sufficient to enable final adjustment of the spacing between the plates **10** and **12** and the cutters carried thereby.

I claim:

1. An adjustable cutter head comprising first and second coaxial annular plates disposed in superposed relation, means for mounting said plates for movement axially toward and away from each other into and out of abutting engagement, said plates when disposed in abutting engagement having a plurality of cylindrical bores extending inwardly of the periphery thereof at the interface between said plates and defining complementary semi-cylindrical sockets in the registering faces of said first and second plates, first and second sets of cutter tools each having a cylindrical body portion adapted to be received in the semi-cylindrical sockets in said first and second plates, means for detachably securing said first set of said tools to said first plate, means for detachably securing said second set of tools to said second plate, and means for adjusting said plates axially toward and away from each other to shift said first and second sets of cutter tools relative to each other.

2. An adjustable cutter head comprising first and second coaxial annular plates disposed in superposed relation, means for mounting said plates for movement axially toward and away from each other into and out of abutting engagement, said plates when disposed in abutting engagement having a plurality of cylindrical bores extending inwardly of the periphery thereof at the interface between said plates and defining complementary semi-cylindrical sockets in the registering faces of said first and second plates, first and second sets of cutter tools each having a cylindrical body portion adapted to be received in the semi-cylindrical sockets in said first and second plates, said body portions of the cutter tools each having a tapped bore extending transverse of the axis thereof, a first set of cap screws mounted in said first plate and each threadedly engaging one of said first set of tools to non-slidably and non-rotatably mount the same on said first plate, a second set of cap screws mounted in said second plate and each threadedly engaging one of said second set of tools to non-slidably and non-rotatably mount the same on said second plate, and means for adjusting said plates axially toward and away from each other to shift said first and second sets of cutter tools relative to each other.

3. An adjustable cutter head comprising first and second coaxial annular plates disposed in superposed relation, means mounting said plates for movement axially toward and away from each other into and out of abutting engagement, said plates when disposed in abutting engagement having first and second sets of cylindrical bores extending inwardly of the periphery thereof parallel to the adjacent side faces of said plates, the axes of

said first set of bores being spaced inwardly from the side face of said first plate a distance less than the radius of said bores to provide a set of major tool receiving sockets in the side face of said first plate and a set of complementary minor tool receiving sockets in the side face of said second plate, the axes of said second set of bores being spaced inwardly of the side face of said second plate a distance less than the radius of said bores to provide a set of major tool receiving sockets in the side face of said second plate and a set of complementary minor tool receiving sockets in said first plate, first and second sets of cutter tools each having a cylindrical body portion adapted to be received in said bores, means for detachably securing said first set of tools in said major sockets in the first plate, means for detachably securing said second set of tools in said major sockets in said second plate, and means for adjusting the spacing between said plates to shift said first and second sets of tools relative to each other.

4. An adjustable cutter head comprising first and second coaxial annular plates disposed in superposed relation, means mounting said plates for movement axially toward and away from each other into and out of abutting engagement, said plates when disposed in abutting engagement having first and second sets of cylindrical bores extending inwardly of the periphery thereof parallel to the adjacent side faces of said plates, the axes of said first set of bores being spaced inwardly from the side face of said first plate a distance less than the radius of said bores to provide a set of major tool receiving sockets in the side face of said first plate and a set of complementary minor tool receiving sockets in the side face of said second plate, the axes of said second set of bores being spaced inwardly of the side face of said second plate a distance less than the radius of said bores to provide a set of major tool receiivng sockets in the side face of said second plate and a set of complementary minor tool receiving sockets in said first plate, first and second sets of cutter tools each having a cylindrical body portion adapted to be received in said bores, said body portions of the cutter tools each having a tapped bore extending transverse to the axis thereof, said first and second plates having a plurality of holes each intersecting the major sockets therein and extending transverse to the axis of said sockets, and cap screws extending through said holes and threaded into said tapped bores in the cutter tools to non-slidably and non-rotatably attach said first and second sets of tools to said first and second plates, and means for adjusting the spacing between said plates to shift said first and second sets of cutter tools relative to each other.

5. The combination of claim 4 wherein said body portions of the cutter tools each have a counterbore therein at one end of said tapped bore, said cap screws having a threaded end engageable in the tapped bore and an enlarged shank portion snugly receivable in said counterbore to accurately locate said cutting tools on said plates.

6. An adjustable cutter head comprising a first annular plate having a first upstanding sleeve thereon, a second annular plate having a second upstanding sleeve surrounding said first sleeve and slidably supported thereon to enable movement of said second plate axially of said first plate, means for detachably mounting said first sleeve on a drive spindle, first and second sets of cutter tools respectively mounted on said first and second plates, one of said plates having a hole extending therethrough and counterbored at the end adjacent the other plate to provide a shoulder therein, means for adjusting said plates relative to each other comprising an adjusting screw having a head end extending through said hole in said one plate and an outwardly extending shoulder engageable with said shoulder in the bore, said screw having a threaded end portion threadedly received in the other of said plates to positively move the plates apart as the screw is turned in one direction, and a lock nut threaded on said first sleeve and engageable with said second sleeve for pressing said plates toward each other to thereby lock the plates in adjusted position.

7. An adjustable cutter head comprising a first annular plate having a first upstanding sleeve thereon, a second annular plate having a second upstanding sleeve surrounding said first sleeve and slidably supported thereon to enable movement of said second plate axially of said first plate into and out of abutting engagement therewith, said plates when disposed in abutting engagement having a plurality of cylindrical bores extending inwardly of the periphery thereof at the interface between said plates and defining complementary semi-cylindrical sockets in the registering faces of said first and second plates, first and second sets of cutter tools each having a cylindrical body portion adapted to be received in the semi-cylindrical sockets in said first and second plates, said body portions of said cutter tools each having a tapped bore extending transverse to the axis thereof, first and second sets of cap screws for respectively mounting said first and second sets of tools on said first and second plates, and means for adjusting the spacing between said plates to shift said first and second sets of tools relative to each other.

8. An adjustable cutter head comprising a first annular plate having a first upstanding sleeve thereon, a second annular plate having a second upstanding sleeve surrounding said first sleeve and slidably supported thereon to enable movement of said second plate axially of said first plate into and out of abutting engagement therewith, said plates when disposed in abutting engagement having a plurality of cylindrical bores extending inwardly of the periphery thereof at the interface between said plates and defining complementary semi-cylindrical sockets in the registering faces of said first and second plates, first and second sets of cutter tools each having a cylindrical body portion adapted to be received in the semi-cylindrical sockets in said first and second plates, said body portions of said cutter tools each having a tapped bore extending transverse to the axis thereof, first and second sets of cap screws for respectively mounting said first and second sets of tools on said first and second plates, one of said plates having a hole therethrough extending parallel to the axis thereof and counterbored at the end adjacent the other of said plates to provide a shoulder therein, an adjusting screw having a head extending through said hole and a shoulder on said head engageable with the shoulder in said bore, said screw having a threaded end portion threaded into the other of said plates to positively move the plates apart when the screw is turned in one direction, and a lock nut threaded on said first sleeve and engageable with said second sleeve to press said plates toward each other and lock the same in adjusted position.

9. The combination of claim 8 wherein the axes of one set of said bores are offset in a direction axially of said head from the axes of the others of said bores, when said plates are in face to face contact.

10. An adjustable cutter head comprising a first annular plate having a first upstanding sleeve thereon, a second annular plate having a second upstanding sleeve surrounding said first sleeve and slidably supported thereon, means for detachably mounting said inner sleeve on a drive spindle, first and second sets of cutter tools respectively mounted on said first and second plates, and means for adjusting said plates relative to each other, and a resilient deformable ring interposed between said plates adjacent the outer periphery thereof to prevent the entrance of chips between the plates.

11. An adjustable cutter head comprising a first annular plate having a first upstanding sleeve thereon, a second annular plate having a second upstanding sleeve surrounding said first sleeve and slidably supported

thereon, means for detachably mounting said inner sleeve on a drive spindle, first and second sets of cutter tools respectively mounted on said first and second plates, means for adjusting said plates relative to each other comprising a plurality of adjusting screws each threadedly mounted in one of said plates and engageable with the other of said plates to positively move the same apart as one adjusting screw is turned in one direction, a lock nut threaded on said first sleeve and engageable with said second sleeve for pressing said plates toward each other and to lock said plates in adjusted position, and a resilient deformable ring interposed between said plates adjacent the outer periphery thereof to prevent the entrance of chips between the plates.

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