

[54] **TWO-PIECE ROUTER BIT ASSEMBLY**

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[22] Filed: **Jan. 8, 1973**

[21] Appl. No.: **321,713**

[52] U.S. Cl. .... **37/142 R, 299/93**

[51] Int. Cl. .... **E02f 9/28**

[58] Field of Search .... **37/141, 142; 299/93**

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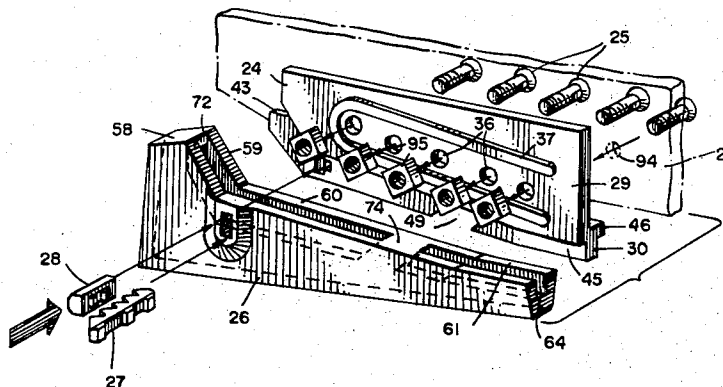
*Primary Examiner*—Clifford D. Crowder

[57] **ABSTRACT**

A two-piece router bit for an earth moving

unit includes adaptor part which is adapted unit includes be removably secured to the earth moving unit and a ground-engaging or wear part which is adapted to be removably secured to the adaptor part. The adaptor includes an elongated nose portion which is provided with a flat bearing surface, and the wear part is provided with an elongated recess which receives the nose portion of the adaptor and which terminates in a flat bearing surface which abuts the flat bearing surface of the adaptor. Both the nose of the adaptor and the recess of the wear part have both generally horizontally extending and generally upwardly extending portions so that the flat bearing surface of the nose can resist thrust loading on the wear part in both the horizontal and vertical directions. The parts are also equipped with cooperating hook means to resist shear forces or torque which would tend to cause relative movement between the parts. The hook means include a rearwardly extending finger on the wear part which extends over the top of the adaptor nose and prevents downward movement of the wear part relative to the adaptor and a lug in the recess of the wear part which is received in a slot in the adaptor nose to resist shear forces and to assist in restraining downward movement of the wear part. Releasable lock means hold the parts together until the wear part requires replacement.

**4 Claims, 15 Drawing Figures**



SHEET 1 OF 3

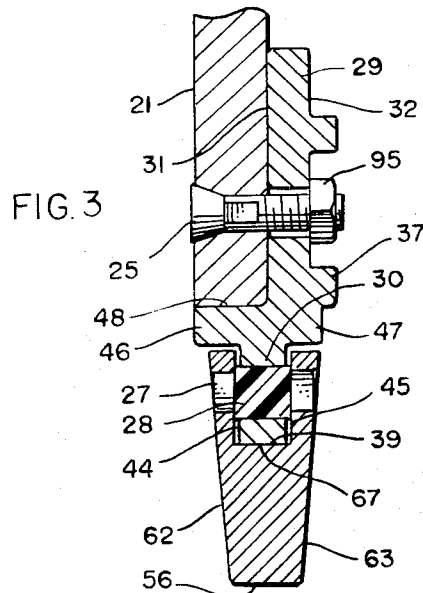
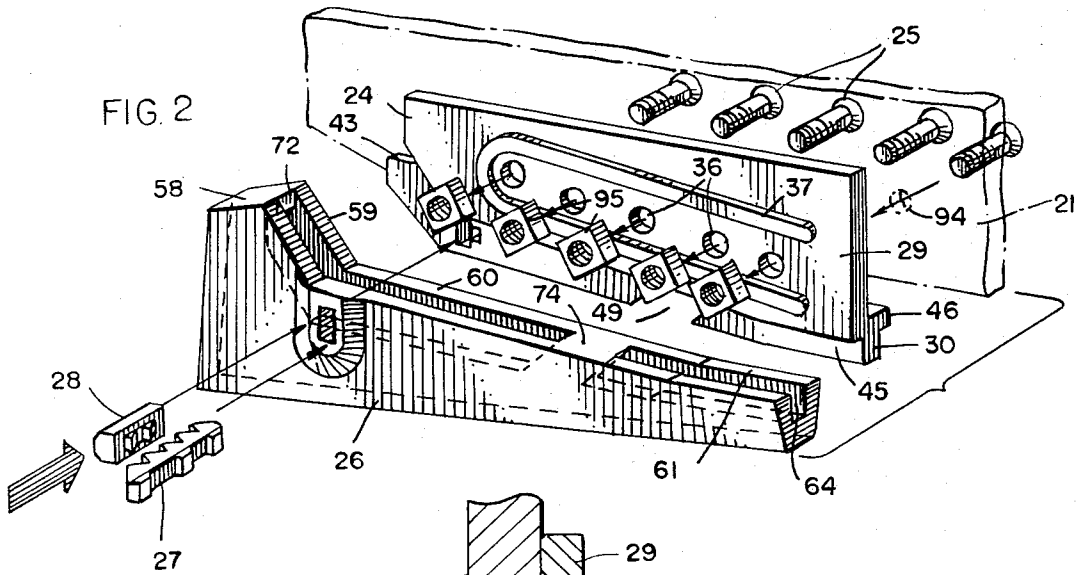
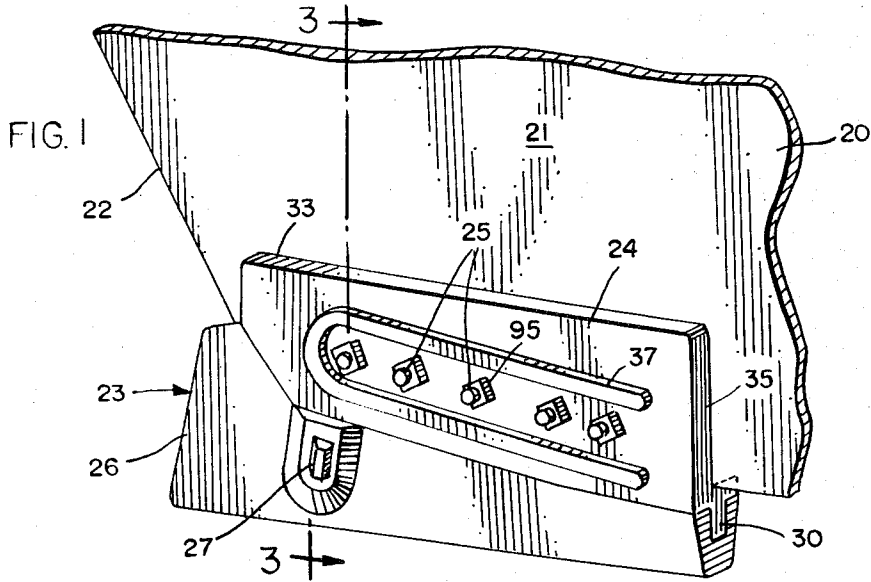


FIG. 4

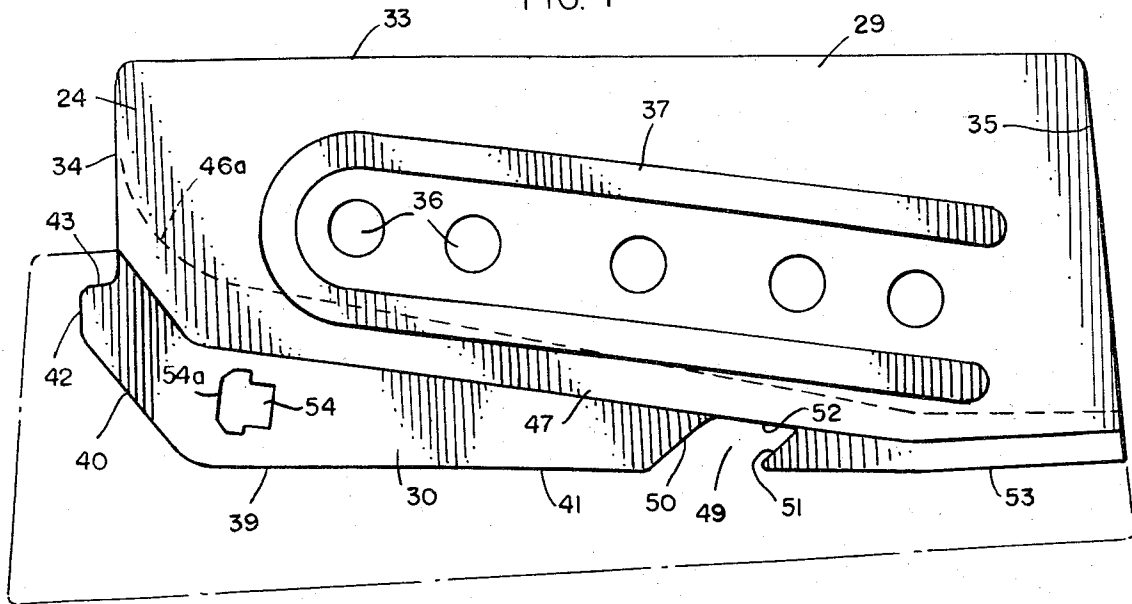


FIG. 5

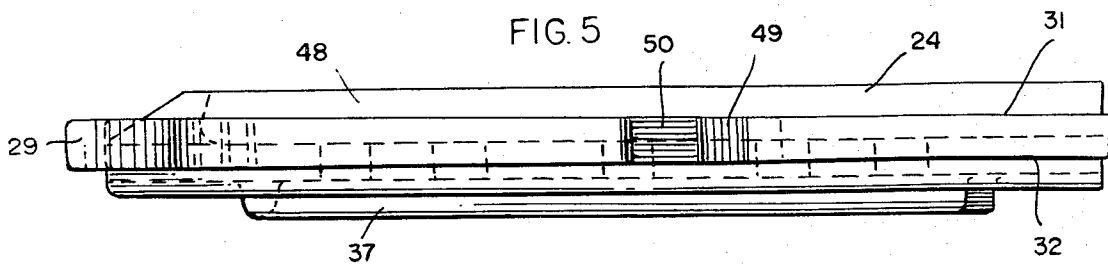


FIG. 6

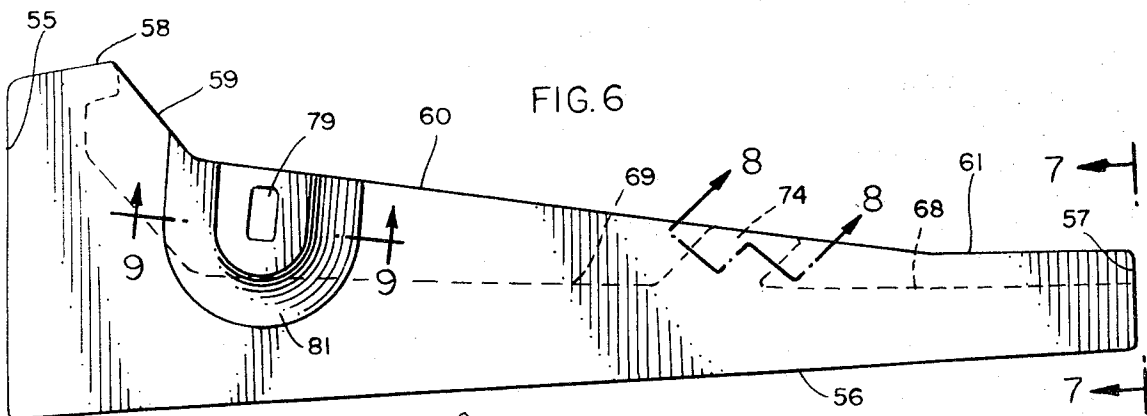


FIG. 7

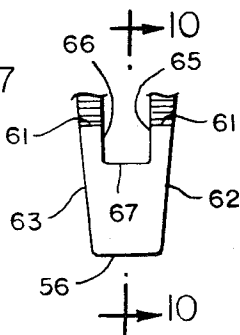


FIG. 8

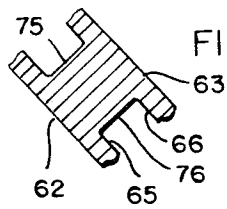
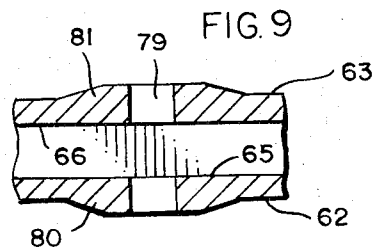


FIG. 9



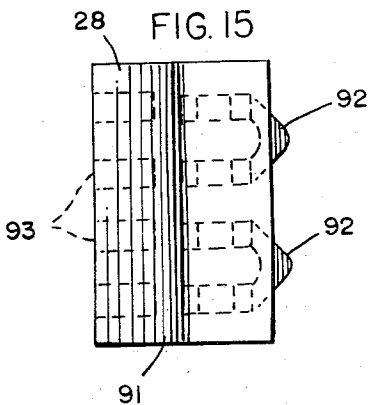
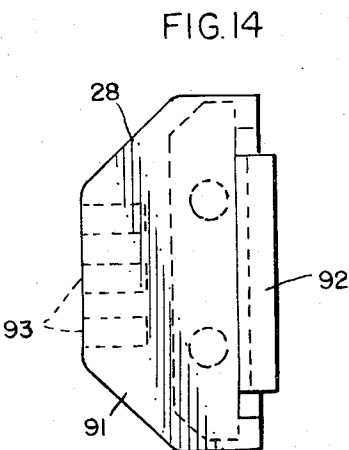
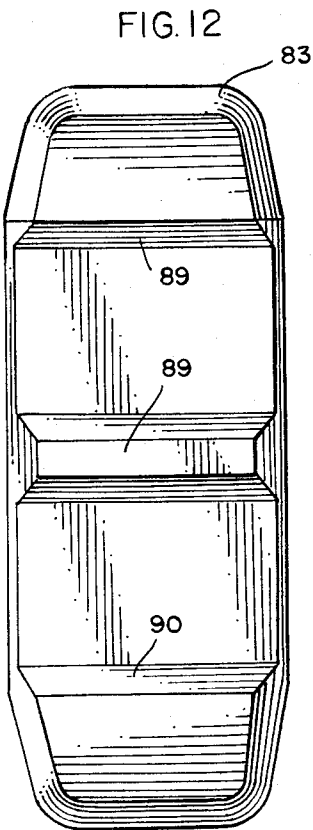
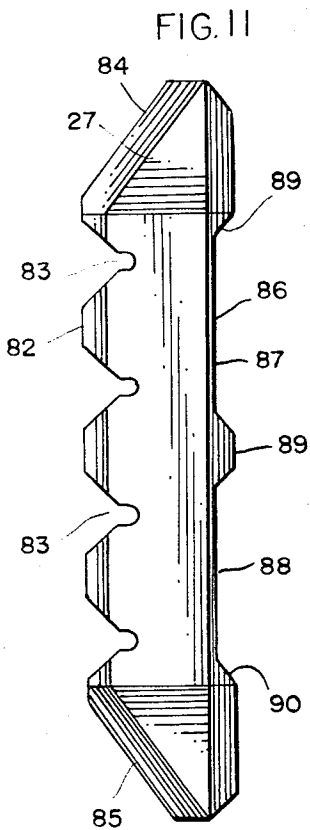
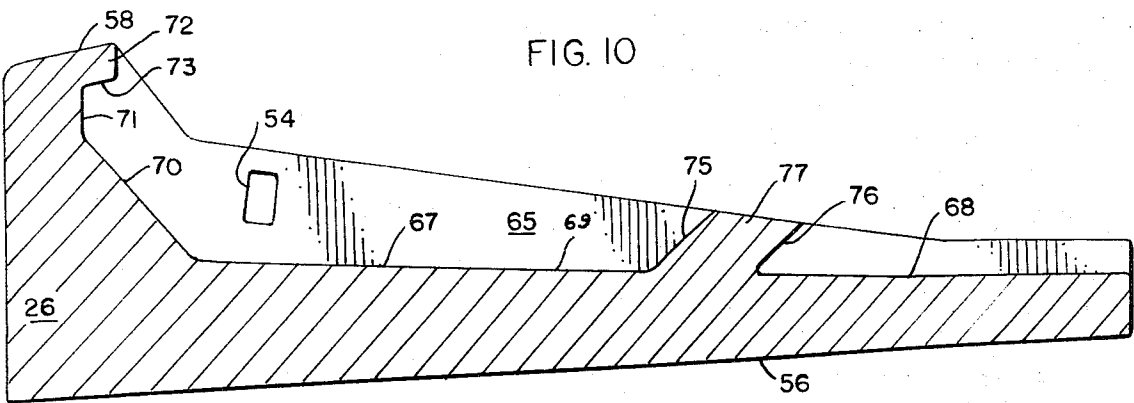
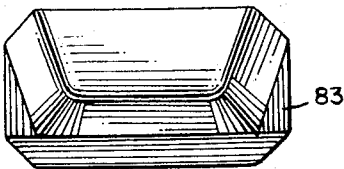


FIG. 13



## TWO-PIECE ROUTER BIT ASSEMBLY

## BACKGROUND

This invention relates to a router bit for an earth moving unit, and, more particularly, to a two piece router bit assembly in which the ground-engaging part of the router bit is securely mounted yet readily replaceable.

Earth moving equipment such as scrapers, bulldozers, dragline buckets, backhoes, shovel dippers, and the like are generally provided with an edge which is adapted to engage and displace earth. Because the main digging unit, for example, the moldboard of a scraper, is relatively expensive, it is desirable to provide a replaceable router bit structure at the sides of the earth-engaging edge of the moldboard to provide better wear life to the scraper. When the replaceable router bit structure becomes excessively worn, it can be removed and replaced with a new router bit so that the sides of the scraper are protected. The router bit must be securely mounted, however, to withstand the considerable forces which are exerted thereon during digging or scraping, and suitable securement is generally obtained only by sacrificing some degree of removability. Further, many so-called replaceable digging parts become distorted under the extreme stresses encountered during use, and replacement of the part is thereby rendered extremely difficult, resulting in considerable down time for the earth moving unit.

## SUMMARY

The invention provides a two piece router bit structure which permits the ground-engaging portion of the router bit to be quickly replaced through a single mechanical lock, thereby eliminating excessive down time of the equipment which may result when the ground-engaging portion of the router bit is attached by bolts. The mounting member of the router bit structure is boltably secured to the digging unit, but this part seldom requires replacing. The second part of the structure provides the ground-engaging edges, and this part is removably secured to the mounting member by a locking pin. Although the ground-engaging part is readily removable from the mounting member, the parts cooperate in a unique manner to provide resistance against almost any type of force that is likely to be encountered during the digging operation.

## DESCRIPTION OF THE DRAWING

The invention will be explained in conjunction with an illustrative embodiment shown in the accompanying drawing, in which

FIG. 1 is a fragmentary perspective view of a portion of an earth moving unit which is equipped with a two piece router bit assembly formed in accordance with the invention;

FIG. 2 is an exploded perspective view of the router bit structure of FIG. 1;

FIG. 3 is a fragmentary sectional view taken along the line 3—3 of FIG. 1;

FIG. 4 is a side elevational view of the adaptor part of the router bit with the ground-engaging part shown in phantom;

FIG. 5 is a top plan view of the adaptor part of FIG. 4;

FIG. 6 is a side elevational view of the ground-engaging part;

FIG. 7 is a fragmentary end elevational view taken along the line 7—7 of FIG. 6;

FIG. 8 is a fragmentary sectional view taken along the line 8—8 of FIG. 6;

FIG. 9 is a fragmentary sectional view taken along the line 9—9 of FIG. 6;

FIG. 10 is a longitudinal sectional view of the ground-engaging part as would be seen along the line 10—10 of FIG. 7;

FIG. 11 is an enlarged side elevational view of the locking pin for the router bit;

FIG. 12 is an end elevational view of the locking pin of FIG. 11;

FIG. 13 is a bottom plan view of the locking pin of FIG. 12;

FIG. 14 is a top plan view of the pin lock member; and

FIG. 15 is a side elevational view of the pin lock member.

## DESCRIPTION OF SPECIFIC EMBODIMENT

The invention will be explained in conjunction with a scraper blade designated generally by the numeral 20 in FIG. 1 which is provided as part of a conventional scraper commonly used, for example, in the construction of roads. The construction of such a scraper blade is well known and need not be explained herein. Moreover, the invention is not limited to scraper blades and is applicable to a variety of earth moving and digging equipment for which a replaceable router bit structure is desired to protect the side edges of the ground-engaging structure.

The scraper blade 20 includes a horizontally extending cutting edge such as can be seen, for example, in U.S. Pat. No. 3,685,177 and generally vertically extending side walls 21 having inclined forward edges 22. A two-piece router bit assembly 23 is removably mounted at the lower forward portion of each of the side walls 21 of the scraper blade and extends forwardly of the juncture between the forward edge of the side wall of the scraper blade and the cutting edge of the scraper blade to protect the forward edge of the side wall.

The router bit assembly 23 includes an adaptor part or mounting member 24 which is removably secured to the side wall 21 of the scraper blade by bolts 25 and a ground-engaging or wear part 26 which is removably secured to the adaptor part by a locking pin 27 and a pin lock member 28 (FIG. 2).

The adaptor 24 is formed from a unitary metal body which includes a substantially planar attaching portion 29 and a nose portion 30 which curves in a generally L-shaped manner from front to rear (FIG. 4). The planar attaching portion 29 includes a pair of flat inner and outer side surfaces 31 and 32 (FIG. 5), a generally horizontally extending top edge 33, and generally vertically extending forward and rearward edges 34 and 35. A plurality of bolt openings 36 are provided through the attaching portion, and an elongated C-shaped raised ridge 37 surrounds the bolt openings at the top, front and bottom to protect the bolts and nuts which secure the adaptor part to the scraper blade from the shearing forces exerted by the earth through which the router bit moves.

The nose portion 30 has a flat lower surface 39 which includes an upwardly and forwardly extending portion 40 and a substantially horizontally extending rearward

portion 41 which extends rearwardly from the forward portion 40. The upper end of the forward portion 40 of the flat wall terminates in a substantially vertically extending portion 42, and the nose is recessed rearwardly above the top portion 42 to provide a shoulder or ledge 43. Inner and outer flat surfaces 44 and 45 (FIG. 3) extend upwardly from the flat bottom wall 39 generally parallel to, but offset from, the flat inner and outer surfaces 31 and 32 of the attaching portion 29 of the adaptor. A pair of flat laterally outwardly extending walls 46 and 47 extend generally perpendicularly from the flat surfaces 44 and 45, respectively, and provide the nose portion with a generally T-shaped transverse cross section. The flat wall 46 is seen to extend substantially beyond the inner surface 31 of the attaching portion of the adaptor to provide a ledge or shoulder 48 which extends below the bottom of the side wall 21 of the scraper and abuts thereagainst when the adaptor is secured in place. The flat wall 47 extends slightly beyond the outer surface 32 of the attaching portion and merges with the C-shaped rib 37 which extends around the bolt openings.

A slot or recess 49 (FIG. 4) is provided in the nose of the adaptor in the rearwardly extending portion thereof between the flat bottom wall 39 and the laterally outwardly extending walls 46 and 47. The recess is seen to include forward and rearward edges 50 and 51 which extend upwardly and rearwardly from the bottom flat wall 39 of the nose and a flat inner edge 52 which is inclined slightly downwardly and rearwardly. The rearward portion 41 of the flat nose surface 39 terminates in an end portion 53 rearwardly of the slot 49 which extends slightly angularly upwardly relative to the remainder of the rearward portion 41 of the nose. A generally T-shaped locking pin opening 54 is provided through the nose portion adjacent the area where the inclined forward portion 40 of the flat wall 39 merges with the rearwardly extending portion 41 thereof.

Referring now to FIGS. 2 and 6-10, the ground-engaging or wear part 26 is formed from a unitary generally L-shaped elongated metal body having a generally straight front edge 55, a generally straight longitudinally extending bottom edge 56, and a straight short rear edge 57. The upper edge of the ground-engaging part is provided by a first portion 58 which extends rearwardly from the upper end of the front edge 55, a second portion 59 which extends downwardly and rearwardly from the edge portion 58, an intermediate portion 60 which extends rearwardly and slightly downwardly from the edge portion 59, and an end portion 61 which extends generally parallel to the bottom edge 56. The wear part also includes inner and outer substantially flat surfaces 62 and 63 (FIGS. 3 and 7) which diverge slightly as they proceed upwardly from the bottom edge 56 to form a somewhat wedged shaped transverse cross section.

A longitudinally extending recess 64 extends inwardly from the upper edge portions 59-61 between the inner and outer surfaces 62 and 63 and is defined by substantially flat, generally parallel side surfaces 65 and 66 and a flat bottom surface 67. As can be seen best in FIG. 10, the flat wall 67 includes a rear end portion 68 which extends generally parallel to the bottom edge 56, an intermediate portion 69 which is inclined slightly upwardly from the end portion 68, a forward portion 70 which extends forwardly and upwardly from

the intermediate portion 69, and a front end portion 71 which terminates in a rearwardly extending finger portion 72 having a flat lower surface 73.

The intermediate portion of the recess is interrupted by a lug 74 which has a longitudinal cross sectional shape corresponding to the shape of the recess 49 in the adaptor nose and which extends upwardly and rearwardly from the intermediate portion 69 of the flat bottom wall of the recess between the side walls of the recess. The lug includes upwardly and rearwardly inclined forward and rearward surfaces 75 and 76, and a flat top surface 77 which extends flush with the upper edge portion 60.

A locking pin opening 79 extends through the spaced-apart walls which define the recess, and the inner and outer surfaces 62 and 63 of the ground-engaging part extend laterally outwardly around the locking pin opening as at 80 and 81 (FIG. 9) to reinforce this area of the wear part.

The locking means for releasably locking the wear part to the adaptor part is shown in FIGS. 11-15 and comprises a locking pin 27 and a pin lock member 28. The locking pin and the pin lock member are similar to the locking means shown and described in U.S. Pat. Nos. 3,685,177 and 3,126,654, to which reference may be had for details. The pin 27 includes a corrugated front surface 82 which is provided with a plurality of recesses or notches 83 and beveled top and bottom portions 84 and 85. Rear surface 86 is provided with a pair of elongated recessed portions 87 and 88 separated by a beveled intermediate outwardly extending portion 89, and the upper and lower portions of the recesses 87 and 88 terminate in beveled surfaces 89 and 90, respectively. The lock member 28 includes a rubber body 91 which encases a pair of metal inserts 92. The metal inserts 92 are generally V-shaped as viewed in FIG. 15, and the bottom portion of the V extends outwardly or rearwardly from the rubber body. The rubber body is provided with 12 holes 93 in the front face thereof to facilitate compression of the rubber.

The adaptor part 24 is secured to the side wall 21 of the scraper blade by pushing the laterally extending wall 46 upwardly against the bottom edge of the side wall of the scraper blade and aligning the bolt openings 36 with the openings 94 (FIG. 2) in the side of the scraper blade. The laterally extending wall 46 of the adaptor curves upwardly adjacent the forward end of the adaptor as indicated at 46a in FIG. 4 to follow the contour of the forward edge of the side wall of the scraper blade, and the engagement between the upwardly curved portion 46a of the wall 46 and the forward edge of the scraper blade helps resist forces tending to push the adaptor rearwardly relative to the scraper blade. The bolts 25 are inserted through the bolt openings in the adaptor and the scraper blade and secured with nuts 95.

After the adaptor is secured to the scraper blade, the pin lock member 28 is inserted into the cross portion 54a (FIG. 4) of the locking opening 54 in the adaptor nose. The rubber body is slightly larger than the opening 54a and is compressed slightly as it is inserted so that the lock member is retained in the opening by friction. The wear part is then mounted on the adaptor by hooking the finger portion 72 at the top of the wear part over the shoulder 43 above the nose of the adaptor and swinging the wear part upwardly so that the adaptor nose is inserted into the recess of the ground-

engaging part and the lug 74 is received in the notch or recess 49 in the adaptor nose. When the wear part is mounted on the adaptor nose, the opening 79 in the wear part is generally aligned with the opening 54 in the adaptor nose, and the locking pin 27 can be driven into these openings. As the locking pin is forced into the opening in the adaptor nose, the notches 83 of the pin receive the metal inserts 92 of the lock member, and the locking means is thereby retained in the position illustrated in FIG. 3.

The elongated wear part is firmly locked to the adaptor with only a single locking pin, and the wear part is secured by the locking pin and the cooperation of the various surfaces of the wear part and the adaptor against movement under any of the forces which are encountered during digging. In one specific embodiment of the invention the inclined pairs of surfaces 50, 75 and 51, 76 each extended at an angle of about 45° to both the bottom edge 56 and the rear edge 57 of the wear part. Forces tending to move the forward end of the wear part downwardly relative to the adaptor are resisted by the finger 72 which engages the shoulder 43 above the adaptor nose. Forces tending to move the rear end of the wear part away from the adaptor are resisted by the engagement between the rear inclined surface 76 of the lug 74 and the rear inclined surface 51 of the recess 49 in the adaptor nose.

Horizontal and vertical components of forces which are exerted on the forward and bottom edges 55 and 56 of the wear part as the router bit moves through material are resisted by forces in the opposite direction which are exerted by the flat bearing surfaces 39 and 53 of the adaptor nose on the flat bearing surfaces 67 and 68 of the recess in the wear part. The flat surfaces 39 and 53 and 67 and 68 provide a butt contact or a substantially butt contact within the limits of economical manufacturing capability, and if there is some initial clearance between the two load-bearing surfaces, the parts will generally move by load force action or wear within a relatively short period of time into butt contact. Rearward horizontal forces are primarily resisted by the forward inclined portion 40 and upwardly extending forward end portion 42 of the adaptor nose, and also by the inclined bearing surface 51 of the recess 49 in the adaptor nose which exerts a force on the inclined bearing surface 76 of the lug 74. There is also engagement between the rearward end of the finger 72 and the forward edge 34 of the planar attaching portion of the adaptor.

Upward vertical components of forces exerted on the wear part are primarily resisted by the rearwardly extending portions 41 and 53 of the adaptor nose which abut the bearing surfaces 67 and 68 of the wear part and by surface 52 of the recess 49 in the adaptor nose which abuts the bearing surface 77 of the lug 74 of the wear part.

Forces which are exerted laterally on the wear part, i.e., forces tending to move the wear part toward or away from the center of the scraper are resisted by the flat inner and outer surfaces 44 and 45 of the adaptor nose which are engageable with the flat surfaces 65 and 66 of the recess in the wear part. Referring to FIG. 3, the flat bearing surfaces 44 and 45 of the adaptor nose and the corresponding flat bearing surfaces 65 and 66 within the recess of the wear part extend generally parallel to a center line through the wear part.

Forward horizontal components which might be exerted on the wear part, as when the scraper is backing up, are generally not too great, and these forces can be resisted by the locking pin and by the engagement between the lug surface 75 and the forward surface 50 of the adaptor nose recess.

When the wear part becomes excessively worn, this part can be quickly removed from the adaptor part by driving the locking pin 27 through the openings in the wear part and the adaptor with a suitable tool. Since horizontal forces exerted on the ground-engaging part in the rearward direction or vertical forces exerted either upwardly or downwardly are resisted by flat bearing surfaces on the adaptor which abut correspondingly shaped surfaces on the wear part, stresses encountered during digging are well resisted, and the locking pin is not required to resist excessive force. Accordingly, the locking means is not likely to become distorted, and the locking pin can be removed without difficulty. After the locking pin is removed, the wear part can be easily slipped off of the adaptor and replaced with a new part.

Heretofore, replacement of a router bit generally required that all of the attaching bolts be removed. This was not only a time-consuming process, but the bolts and the nuts might have become distorted due to shear forces, thereby rendering removal of the bolts extremely difficult. In contrast to this the invention permits quick replacement by means of the single drive-through locking pin. Further, the replaceable wear part is lighter than a conventional one-piece router bit, making it easier to change the worn part and resulting in savings of material.

While in the foregoing specification a detailed description of a specific embodiment of the invention was set forth for the purpose of illustration, it is to be understood that many of the details herein given may be varied considerably by those skilled in the art without departing from the spirit and scope of the invention.

We claim:

1. A two-piece router bit comprising an adaptor part adapted to be secured to an earth moving unit and a substantially flat wear part releasably secured to the adaptor part, the adaptor part having
  - a. an upper attaching portion for attaching the adaptor to the earth moving unit and
  - b. an elongated lower nose portion, the nose portion having
    - i. a pair of spaced-apart side surfaces,
    - ii. a substantially flat lower surface extending between the side surfaces,
    - iii. a substantially flat forward surface extending upwardly from the lower surface, the forward surface including an upwardly and forwardly inclined portion extending from the lower surface and a substantially vertically extending portion extending upwardly from the inclined portion, and
    - iv. a substantially flat shoulder extending rearwardly from the vertically extending portion of the forward surface,
 the wear part having
  - a. a lower ground-engaging portion having an upwardly extending front ground-engaging surface and a rearwardly extending bottom ground-engaging surface and substantially flat outer side surfaces, and

b. an elongated upper recess portion, the recess portion having an elongated upper edge provided with an upwardly opening longitudinally extending enclosed recess therein, the recess being defined by a pair of spaced-apart downwardly extending side surfaces and a substantially flat inner bearing surface extending between the downwardly extending side surfaces, the inner bearing surface of the recess having a generally longitudinally extending rearward portion and a forward portion extending upwardly from the rearward portion, the forward portion of the inner bearing surface including an upwardly and forwardly inclined portion which abuts the inclined portion of the forward surface of the adaptor nose and a substantially vertically extending portion which abuts the vertically extending portion of the forward surface of the adaptor nose, and

c. a finger portion extending rearwardly from the vertically extending portion of the forward portion of the inner bearing surface of the recess,

the nose portion of the adaptor part being received by the recess in the wear part with the flat lower and forward surfaces of the nose portion abutting, respectively, the rear and forward portions of the inner bearing surface of the recess to prevent upward and rearward movement of the wear part relative to the adaptor part, and the finger portion abutting the flat shoulder of the nose portion to prevent downward movement of the forward portion of the wear part relative to the adaptor part and the side surfaces of the nose portion being engageable with the side surfaces of the recess to restrain transverse relative movement between the wear part and the adaptor part, and locking means extending through the side surfaces of the wear part and of the nose portion of the adaptor part and releasably securing the wear part and the adaptor part together.

2. A two-piece router bit comprising an adaptor part adapted to be secured to an earth moving unit and a substantially flat wear part releasably secured to the adaptor part, the adaptor part having

- a. an upper attaching portion for attaching the adaptor to the earth moving unit and
- b. an elongated lower nose portion, the nose portion having
  - i. a pair of spaced-apart side surfaces,
  - ii. a substantially flat lower surface extending between the side surfaces,
  - iii. a substantially flat forward surface extending upwardly from the lower surface,
  - iv. a substantially flat shoulder extending rearwardly from the forward surface, and
  - v. a recess extending upwardly and rearwardly from the lower surface of the nose portion and having upwardly and rearwardly inclined substantially flat front and rear surfaces,

the wear part having

- a. a lower ground-engaging portion having an upwardly extending front ground-engaging surface and a rearwardly extending bottom ground-engaging surface and substantially flat outer side surfaces, and
- b. an elongated upper recess portion, the recess portion having an elongated upper edge provided with an upwardly opening longitudinally extending enclosed recess therein, the recess being defined by

a pair of spaced-apart downwardly extending side surfaces and a substantially flat inner bearing surface extending between the downwardly extending side surfaces, the inner bearing surface of the recess having a generally longitudinally extending rearward portion and a forward portion extending upwardly from the rearward portion,

c. a finger portion extending rearwardly from the forward portion of the inner bearing surface of the recess,

d. lug means extending upwardly and rearwardly from the inner bearing surface of the recess and having upwardly and rearwardly inclined substantially flat front and rear surfaces, the nose portion of the adaptor part being received by the recess in the wear part with the flat lower and forward surfaces of the nose portion abutting, respectively, the rear and forward portions of the inner bearing surface of the recess to prevent upward and rearward movement of the wear part relative to the adaptor part, the finger portion abutting the flat shoulder of the nose portion and the front and rear surfaces of the lug means abutting the front and rear surfaces of the recess in the nose portion to prevent downward movement of the wear part relative to the adaptor part, and the side surfaces of the nose portion being engageable with the side surfaces of the recess to restrain transverse relative movement between the wear part and the adaptor part, and locking means extending through the side surfaces of the wear part and of the nose portion of the adaptor part and releasably securing the wear part and the adaptor part together.

3. The structure of claim 2 in which the forward surface of the nose portion of the adaptor part includes an upwardly and forwardly inclined portion extending from the lower surface and a substantially vertically extending portion extending upwardly from the inclined portion, the shoulder extending rearwardly from the vertically extending portion, the forward portion of the inner bearing surface of the recess in the wear part including an upwardly and forwardly inclined portion which abuts the inclined portion of the forward surface of the adaptor nose and a substantially vertically extending portion which abuts the vertically extending portion of the forward surface of the adaptor nose, the finger portion extending rearwardly from the vertically extending portion of the inner bearing surface of the recess.

4. A replaceable router bit part adapted to be secured to a mounting member comprising a substantially flat elongated body having an upwardly extending front ground-engaging surface and a rearwardly extending bottom ground-engaging surface, a pair of substantially flat outer side surfaces, and an elongated top edge, the top edge being provided with a longitudinally extending upwardly opening recess, the recess being defined by a pair of spaced-apart downwardly extending side surfaces and a substantially flat inner bearing surface extending between the downwardly extending side surfaces, the inner bearing surface having a generally longitudinally extending rearward portion and a forward portion extending upwardly from the rearward portion, a finger portion extending rearwardly from the inner bearing surface at the upper end of the forward portion thereof, and lug means extending upwardly and rearwardly from the inner bearing surface in the rearward



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portion thereof, the lug means having upwardly and rearwardly inclined substantially flat front and rear surfaces, the finger portion being adapted to engage a shoulder on the mounting member and the lug means being adapted to be received in a recess provided in the mounting member, the router bit part being provided with a locking opening extending through the side surfaces thereof intermediate the finger portion and the lug means and above the inner bearing surface of the

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recess, the locking opening being positioned closer to the finger portion than to the lug means and being adapted to receive locking means extending through the side surfaces and the recess therebetween whereby the router bit part can be releasably secured to a mounting member positioned in the recess by a single locking means extending through said locking opening.

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