REPLACEABLE PINNED-ON CUTTING EDGE

Inventors: William J. Black, Wilmington, William E. Lanz; Eugene M. Wilson, both of Joliet, all of Ill.

Assignee: Caterpillar Tractor Co., Peoria, Ill.

Filed: Oct. 12, 1971

Appl. No.: 188,219

U.S. Cl. ...................................................................... 37/141 R
Int. Cl. ..................................................................... E02F 9/28
Field of Search ....................................................... 37/141 R, 141 T, 37/142

References Cited

UNITED STATES PATENTS
2,285,039 6/1942 Lowe .............................................. 37/141 R
2,716,824 9/1955 Francis ......................................... 37/141 R X
2,981,015 4/1961 Duke ............................................. 37/141 T
3,283,426 11/1966 Payne ........................................... 37/141 R

3,456,370 7/1969 Gilbertson ...................................... 37/141 R
3,520,076 7/1970 Nichols .......................................... 37/141 R
3,621,594 11/1971 Hahn et al................................... 37/141 T

Primary Examiner—Edgar S. Burr
Attorney—Warren J. Krauss and Fryer, Tjensvald, Feix, Phillips & Lempio

ABSTRACT

A quickly and easily replaceable cutting edge assembly for an earthmoving scraper or the like having a plurality of discrete cutting edge elements which are removable by means of "drive out" pins to a cutting edge support member. The cutting edge support member is integral with the scraper bowl or the like. Each cutting edge element is provided with a bifurcated portion which engagingly straddles the edge support member. Holes are provided in each edge element which register with holes in the support member to provide bores through which the drive-out pins are inserted to retain the cutting edge elements in place.

6 Claims, 8 Drawing Figures
REPLACEABLE PINNED-ON CUTTING EDGE

BACKGROUND OF THE INVENTION

This invention relates to earthmoving equipment and, more particularly, to a quick-change replaceable cutting edge assembly which can be utilized on scrapers, bulldozers, loader buckets and the like to facilitate the loading and moving of earth or other materials.

Several forms of powered earthmoving apparatus and general-purpose, bulk-handling equipment have a material-carrying receptacle or pushing means which is forcibly driven through the material. Apparatus of this general type usually requires an extremely strong and wear-resistant cutting edge secured to the material-engaging portions thereof. The material engaged by the cutting edge is often very hard or abrasive. Thus, frequent replacement of the cutting edge is usually required due to part fracture or excessive wear.

To provide a practical system for replacement of a cutting edge assembly when excessive wear or breakage occurs, the prior art has developed a variety of constructions in which the cutting edge is attached to a scraper or bulldozer by disengageable means.

The cutting edge of some of the larger earthmovers is comprised of a plurality of rather large and heavy reversable sections which create a handling and safety problem for the installer. Sometimes the central portion of the cutting edge is longer than the flanking outer ends and forms a stinger portion which extends below the leading edges of the flanking edges. This arrangement further adds to the bulk and safety problem because of the various sizes of the parts involved and the difficulty in fitting them.

In the majority of applications, cutting edges are secured to support means by a plurality of plow bolts and nuts. The plow bolt is prevented from turning during tightening by a square shank portion on the bolt which closely engages a square hole in the cutting edge. Manufacture of this square hole in the cutting edge is relatively expensive. Also, the corners of such a square hole tend to create stress risers in the cutting edge during heat treatment thereof which can cause premature failure of the cutting edge. Furthermore, the nuts which engage the plow bolts usually sustain damage and wear during normal operation of the equipment and the removal thereof becomes extremely difficult. Usually, they must be cut off with an acetylene torch before the cutting edge assembly can be removed. This procedure is very time consuming and expensive inasmuch as a great number of nuts are usually involved.

Thus, the majority of presently known replaceable cutting edge assemblies are excessively bulky, dangerous and unwieldy to handle and may be inordinately expensive and time-consuming to replace.

SUMMARY OF THE INVENTION

This invention is a cutting edge assembly providing high strength and ease of replacement in a compact structural arrangement. A plurality of small, lightweight, easily handled cutting edge elements engage a cutting edge support member and are retained thereupon by means of drive-out pins. The cutting edge elements are provided with forked portions which engage the support member between their furcations. A plurality of holes are provided in the elements which register with holes in the support member and which retain the drive-out pins.

A plurality of like cutting edge elements may be aligned so that their leading edges are colinear to produce a relatively flat, uniform cutting edge. Or, the elements may be arranged so that a wider central portion can be flanked with narrower elements to provide a stinger-type cutting edge.

The instant invention also provides means by which clockwise and counterclockwise moments which act upon the cutting edge elements are resisted by overlapping support means.

One object of this invention is to provide a replaceable cutting edge assembly for earthmoving equipment which can be quickly and easily installed.

Another object of the invention is to provide an improved, economical, and safely handled cutting edge assembly.

Still another object of the invention is to provide a boltless cutting edge structure for interlocking engagement with a support member.

Another object of the invention is to provide a structure which is more versatile and flexible than present cutting edge structures.

Other objects of the present invention will become apparent from the following description and claims. The accompanying drawing, by way of illustration, shows the preferred embodiments of the present invention, the principles thereof and what are considered to be the best methods for applying these principles. Other embodiments of the invention with the same or equivalent principles may be used and structural changes may be made as desired by those skilled in the art without departing from the spirit of the present invention and the scope of the appended claims.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view of the forward portion of an earthmoving scraper bowl having a cutting edge assembly in accordance with the present invention;

FIG. 2 is an enlarged, partially broken away, top elevational view of part of the cutting edge assembly of FIG. 1;

FIG. 3 is a sectional view, taken along lines III—III of FIG. 2, illustrating the internal details of the cutting edge assembly;

FIG. 4 is a sectional view, taken along lines IV—IV of FIG. 2 illustrating further internal details of the cutting edge assembly;

FIG. 5 is another sectional view, taken along lines V—V of FIG. 2 illustrating some of the internal construction of the cutting edge assembly;

FIG. 6 is a perspective view of an individual cutting edge element showing the rear forked ends thereof;

FIG. 7 is a sectional view, similar to FIG. 4, showing an alternate embodiment of the subject invention;

FIG. 8 is a view taken along lines VIII—VIII of FIG. 7 illustrating further details of the alternate embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A replaceable, quick-change cutting edge assembly, generally indicated at 10, is shown attached to the bowl of an earthmoving scraper 12 of generally conventional construction. Such a scraper bowl 12 has a floor 14 comprised of a pair of plates 16 and 18 spaced apart by a plurality of channel members 20. Plates 16 and 18 are joined along their forward edges by means of welding.
3,736,664

3 to a downwardly projecting cutting edge support plate 22. A pair of spaced sidewalls 24 and 26 extending vertically upwardly from the opposite sides of the floor and a rear ejector wall (not shown) define the complete assemblage. Plate 22 defines the forward edge of the scraper floor and is the support member to which the replaceable cutting edge assembly 10 is attached. The leading edge 26 of the support 22 is chamfered, as best shown in FIG. 3. A plurality of spaced, vertical gussets 30 secured to the bottom surface of plate 18 and at the rear of plate 22 stiffens the cutting edge support structure.

A relatively long transverse wear plate member 32 and a pair of smaller end sections 34 flank plate 32 and are removably secured to the top side 35 of plate 22 by a plurality of plow bolts 36 and 38. Bolts 36 also secure to the bottom side 39 of plate 22 at specific locations. A plurality of block members 40 are provided which, in combination with the wear plates 32 and 34 and cutting edge support 22, support the cutting edge assemblies 10.

Each cutting edge assembly 10 is comprised of a plurality of lightweight, easily handled, pinned-on cutting edge elements. In this particular arrangement, seven elements are required to complete the full edge design. It is recognized that, depending upon the size of the scraper vehicle upon which the subject invention is employed, the number of elements will vary. The cutting edge shown is symmetrical with respect to the longitudinal center line 42 of the scraper bowl. The subject scraper has an edge assembly with a central stinger portion comprised of a relatively narrow, centrally located element 44 which is flanked by two immediately adjacent wider elements 46. It should be recognized that not all scrapers or bulldozer applications will require cutting edge assemblies with a central stinger portion but some will merely employ a plurality of lightweight, easily handled, pinned-on cutting edge elements of common dimensions. A machine with a cutting edge employing a stinger portion, however, permits the concentration of vehicle horsepower in a relatively small central area of the cutting edge and allows the device to cut harder material.

The stinger elements 44 and 46 are flanked by four, two on each side, relatively small cutting edge elements 48. Each of the seven elements 44, 46 and 48 has a frontal portion 49 and a forked rear portion which is comprised of an upper flange or furluration 50 and a lower flange 52, each of which is engaged by slots 54 and 56 formed by wear plates 32 and 34 and blocks 40.

The support plate 22 is engaged between the furlurations 50 and 52 with the member 50 disposed in overlapping face-to-face relationship with the top side 35 of support plate 22 and the member 52 disposed in overlapping relationship with the lower side 39 of said support plate.

Each of the seven cutting edge elements is retained on the support plate 22 by two drive-out type retaining pins 58. Retaining pins 58 are inserted in aligned holes 60, 62, 64, 66 and 68 in the wear plates 32 and 34, flange 50 support 22, flange 52 and block 40, respectively. The pins 58 are retained in the aligned holes by means of a snap ring 69 one of which is shown located in a shallow counterbore 70 in block 40. An annular groove 71 near one end of the retaining pin engages the snap ring 69. An annular chamfer 72 on the retaining pin 58 helps expand the snap ring 69 for facile installation of the retaining pin. Removal of the cutting edge elements can be accomplished by merely driving out the retaining pins by means of a hammer or the like.

The manufacturing tolerances between the slots 54 and 56 and the flanges 50 and 52 are relatively close, but are such that the cutting edge elements can easily be installed prior to the insertion of the retaining pins. The retaining pins, per se, are not load-carrying members. A clearance is provided between the pins in the holes 60, 62, 64, 66 and 68 and this is greater than the clearance between the flanges 50 and 52 and the slots 54 and 56. With the wear plates 32 and 34 overlapping furlurations 52 and with blocks 40 overlapping furlations 52, clockwise and counterclockwise moments acting on the cutting edge elements, as seen in FIG. 3, are resisted. Loads acting longitudinally rearwardly on the forward end of the cutting edge elements are resisted by the extreme rear surfaces 74 and 76 of the flanges 50 and 52 contacting the root surfaces 78 and 80 of slots 54 and 56.

In the particular design shown in FIGS. 1–4, the cutting edge support plate 22 is integral with the scraper floor and has a straight central portion 82 which is normal to the direction of travel of the scraper and which extends slightly forwardly of the flanking side portions 84 which portions are also orthogonal to the direction of travel of the scraper. The central portion and the outer end portions are joined by an angled section 86. The width of the central portion 82 is the same as the width of the stinger portion of the cutting edge assembly. This provides added support for the cutting edge elements 44 and 46 which comprise the stinger portion of the cutting edge. The flanking cutting edge elements 48 have internally angled, lateral relief portions 87 which closely mate with complementary angled portions 86 in the cutting edge support plate 22. By providing like relief portions 87 at both ends of the elements 48, the elements can be used interchangeably on either side of the central stinger for convenience and economy.

Most of the wear on the cutting edge assemblies occurs on the forward leading edge of each element. Thus, it is convenient to replace the individual elements, as needed, usually several times, before replacement of the entire overlapping wear plates 32 and 34 is necessary. This can be easily accomplished with the instant invention.

FIGS. 7 and 8 disclose an alternate form of the quick-change cutting edge assembly which embodies the same principles and concepts as the arrangement just described. Relatively small cutting edge elements 90 comprise an edge portion 92 and a pair of downwardly projecting bracket means 96 and 98 which are secured to or integral with the bottom sides of the edge elements. Each pair of brackets 96 and 98 is located near the outer ends of each cutting edge element 90. The cutting edge portion 92 and brackets 96 and 98 engage an edge support member 100 and a rearwardly extending flange portion 102 extends in overlapping relationship between a first surface 103 of said support member and a second slot-forming surface formed in a replaceable wear plate 106 which is secured to said first side. Brackets 96 and 98 overlap a bottom surface 107 of the support member 100. The wear plate 106 and the brackets 96 and 98 resist clockwise and counterclockwise moments in the same manner as did the components of the cutting edge assembly shown in FIGS.
1—4. Longitudinal loads which act on the cutting edge elements are resisted by the leading edge 108 of support member 100 which contacts the surface 110 on brackets 96 and 98. Brackets 96 and 98 also have a vertical slot 112 which receives a vertically oriented plate member 114 secured to the bottom side of the cutting edge support member 100 and to a support plate 116 in the scraper bowl floor. The individual edge elements 90 are removably secured in place by a pair of retaining pins 118. The retaining pins are inserted through aligned holes 120 into brackets 96 and 98 and holes 122 in the plate 114, in the manner previously described. The retaining pins are disposed laterally beneath the cutting edge elements and are preferably of the quick-change type but can be of any conventional design which would afford easy installation and removal of the cutting edge assemblies.

While we have illustrated and described the preferred embodiments of our invention, it is to be understood that these are capable of variations and modifications and we do not wish to be limited to the precise details set forth, but desire to avail ourselves of all changes and alterations as fall within the scope of the appended claims.

What is claimed is:

1. A readily replaceable cutting edge assemblage for an earthmoving device having an edge support member attached thereto; said edge support member having first and second surfaces thereon, said cutting edge assemblage including separate cutting edge element means releasably secured to said edge support member, said edge element means including an integral bifurcated portion, each integral furcation of said bifurcated portion supportingly engaging one of said first and second surfaces, easily insertable and removable fastening means for fixedly attaching said cutting edge element means to said edge support member, supportive wear plate means attached to one of said first and second surfaces of said edge support member in overlapping, load-bearing relationship with one of said integral furcations of said bifurcated portion of said cutting edge element means for supporting said one of said furcations against loading transmitted therethrough.

2. The invention defined in claim 1 wherein said fastening means include easily insertable and removable pin means.

3. The invention of claim 1 wherein said other of said first and second surfaces has bracket means attached thereto for countering with one of said integral furcations to fixedly retain said cutting edge element means on said edge support member.

4. The invention of claim 1 wherein there are a plurality of cutting edge element means and wherein some of said plurality of cutting edge element means are of different dimensions than other of said plurality of cutting edge element means, whereby upon assembly of said plurality of said cutting edge element means a non-uniform composite cutting edge assemblage is formed thereby.

5. The invention of claim 3 wherein said fastening means is easily insertable and removable pin means, and wherein said pin means is inserted through said bracket means and through said one of said integral furcations, said pin means having an axis which lies within a plane which is parallel to said first and second surfaces when inserted.

6. The invention defined in claim 1 wherein said earthmoving device is a tractor-drawn scraper vehicle.

* * * * *