July 14, 1970 I. H. NICHOLS 3,520,076

BLADE ARRANGEMENT FOR EARTHMOVING EQUIPMENT

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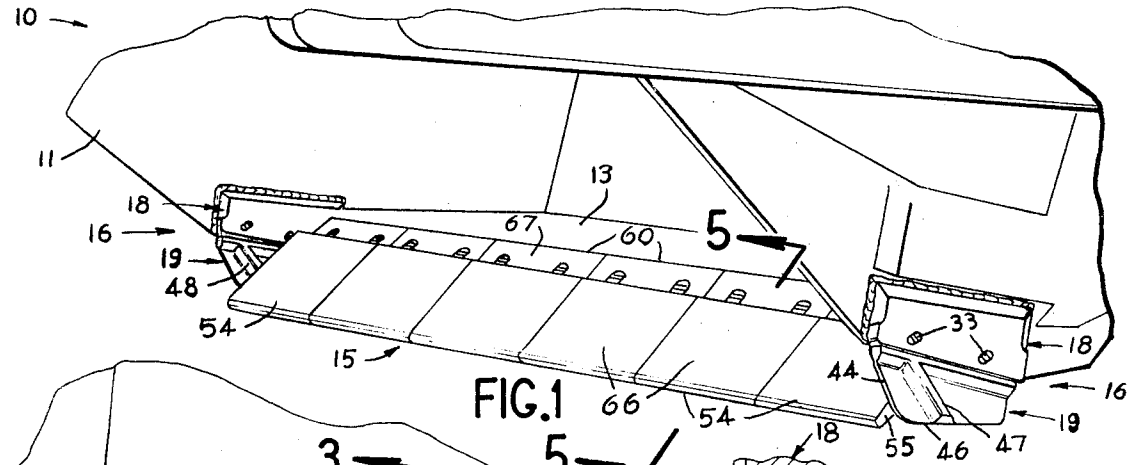

FIG.1

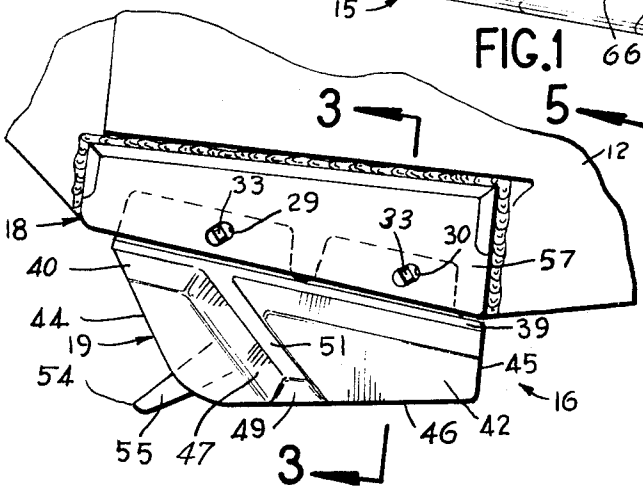

FIG.2

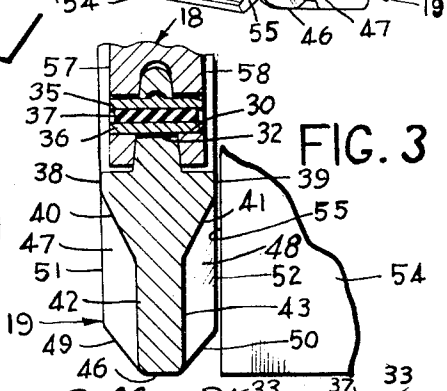

FIG. 3

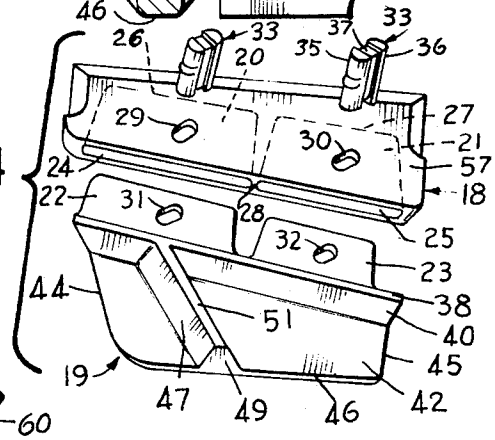

FIG.4

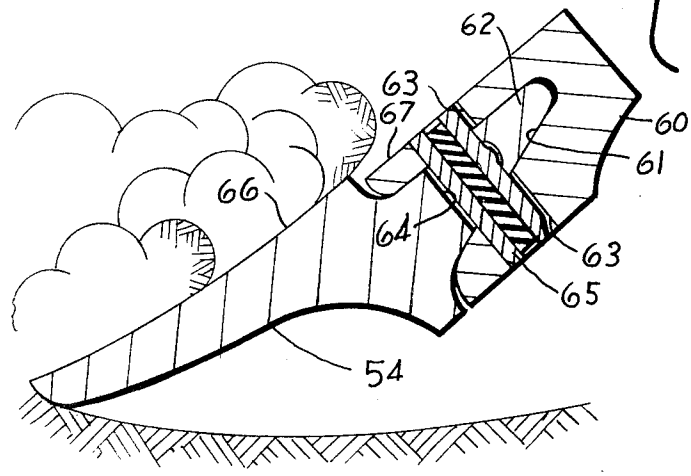

FIG.5

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BLADE ARRANGEMENT FOR EARTHMOVING EQUIPMENT

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ABSTRACT OF THE DISCLOSURE

An earth-engaging blade arrangement including a member having a portion to engage the earth and a plurality of portions projecting from one edge thereof for receipt in recesses in a supporting member and held by drive pins, said projecting portions tapering in thickness outwardly from said edge, the earth-engaging surface of the blade projecting laterally outwardly of the surface of the supporting member.

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates to blade devices for earthmoving equipment.

The prior art

For earthmoving equipment, the earth-engaging elements, such as blades, teeth, router bits or the like, are made as removable elements in order that they may be replaced after they have been worn. For many jobs, frequent blade replacement is required, resulting in downtime of the equipment and expensive labor costs in the removal and installation operations. Securing the earth-engaging elements by bolts is unsatisfactory in that installing and removing these elements then becomes particularly time-consuming and costly. Not only is it laborious to attach the bolts, but generally they cannot be loosened but must be cut off after a period of service.

Considerable saving may be realized if the blade device is especially made for quick attachment and removal through the utilization of special support adapters and unthreaded drive pin fasteners. An example of this is illustrated in my prior Pat. No. 3,160,967 in which the blade is provided with wedge-shaped recesses which receive complemenary projecting portions of an adapter to be held in place by transversely extending drive pins. It is a much simpler operation to fit the blade onto the projecting adapter and secure it with the drive pins than previous designs. Removal is correspondingly made an easier and faster operation. However, with this construction, a problem can be encountered as the blade wears during the use of the equipment. Blades may wear quite rapidly, but for economy should be used to the maximum extent of their lives. As the blade of this patent is used, it is possible to wear through the wall of the blade at the recess that receives the projecting support element. When that occurs, the support then presents a portion of the surface engaged by the earth, and is itself subjected to wear as the equipment is used. The result is the necessity for a slow and expensive replacement of the supporting device.

An additional problem is encountered with scrapers, which conventionally include a transverse blade in the unit, adjacent either end of which is positioned a router bit. The latter elements are vertically positioned and provide a smooth cut of the earth at the ends of the area engaged by the blade. This materially reduces the wear at the side portions of the scraper. These router bits not only have been difficult to remove and replace,

but also have been prone to damage during use of the scraper. They are carried by the sidewalls of the scraper and spaced slightly outwardly of the ends of the blade. Hence, they are without lateral support and can be deflected inwardly when an unyielding object is encountered during use of the scraper. Frequently, these inward side loads cause breakage of the router bits. Even more serious, they may bend the sidewall of the scraper inwardly so that the front opening is distorted and the gate no longer may be closed for retaining the earth within the scraper body. When this occurs, the scraper is immobilized until jacks can be applied to the scraper walls to bend them back to their original contours. Obviously, again, there is a loss of operating time and a significant expense involved.

SUMMARY OF THE INVENTION

The present invention provides an arrangement for removable earth-engaging elements avoiding the difficulties outlined above. Blades of various types constructed in accordance with this invention are readily installed and removed, yet the danger of wearing the supporting device is avoided. In this arrangement, the blade element is provided with a wedge-shaped projecting portion which extends into a recess in the supporting member carried by the earthmoving equipment. Thus, no recessed portion is included in the blade, and the support is remote from the part of the blade that contacts the earth. Consequently, it is possible to wear the blade completely without danger of damage to the supporting member. There is no wall of the blade to be worn through to give access to the support. More of the earth-engaging member may be allowed to wear away before a replacement is necessary.

Preferably, the surface of the supporting member is displaced laterally inwardly of the surface of the member that engages the earth. This means that, as the earth passes back to the area of the supporting member, the pressure is relieved and looser material contacts the support. This further minimizes the possibility of wear of the support member.

For vertically suspended blade elements, such as router bits for scrapers, a rib is included along the bit surface. The rib is positioned closely adjacent the edge of the scraper blade, so that the rib and blade effectively back up the router bit and provide it with lateral support. Inward loads on the router bit, therefore, do not damage either the bit or the sidewall of the scraper. The rib is inclined, so that engagement with the blade edge will be assured, regardless of the make of scraper and variations in blade positioning. Ribs may be provided on both sides of the router bit, so that they are usable at either end of the scraper blade, and it is unnecessary to provide right-and left-hand parts.

An object of this invention is to provide an improved arrangement for removable earth-engaging elements of earthmoving equipment.

Another object of this invention is to provide an earth-engaging device with a greater cacapity for wear.

Yet another object of this invention is to provide an earth-engaging blade device that is easily and rapidly installed and removed.

A further object of this invention is to provide a blade, bit or the like where the possibility of wear of the supporting device is minimal.

An additional object of this invention is to provide full lateral support for a router bit or the like to protect the bit and equipment with which it is associated from damage.

A still further object of this invention is to provide

a router bit or the like which is usable on either side of a scraper or other item of earthmoving equipment.

These and other objects will become apparent from the following detailed description taken in connection with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a fragmentary perspectice view of a scraper incorporating the invention.

FIG. 2 is an enlarger fragmentary elevational view of the lower forward corner portion of the scraper;

FIG. 3 is a transverse sectional view taken along line 3—3 of FIG. 2;

FIG. 4 is an exploded perspective view of the router bit, adapter support and drive pins; and

FIG. 5 is a sectional view taken along the line 5—5 of FIG. 1 showing the attachment of the blade.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As shown in the drawing, the arrangement of this invention is used in conjunction with a scraper **10** of otherwise conventional construction. The scraper includes spaced sidewalls **11** and **12** extending vertically from the opposite edges of a bottom wall **13**, thereby defining the bowl for receiving earth as the scraper is in operation. Extending transversely of the machine at the forward edge of the bottom wall **13** is a blade assembly **15**. A router bit assembly **16** is located at the forward corner of each of the sidewalls **11** and **12**.

Each router bit assembly **16** includes an adapter support **18** and a generally flat router bit or blade **19**. The adapter **18**, which is secured to the lower forward corner of the sidewall by suitable means, such as welding, includes recesses that receive projecting portions of the router bit **19**. In the embodiment illustrated, there are two elongater recesses **20** and **21** into which fit projections **22** and **23** of the router bit. The recesses **20** and **21** are substantially wedge-shaped tapering inwardly from their larger open ends **24** and **25** to their inner edges **26** and **27**. There is also some inward convergence of the side edges of the recesses **20** and **21**. A strengthening web **28** is interposed between the recesses **20** and **21**. When assembled, the projections **22** and **23** are substantially complementarily received in the recesses **20** and **21**.

Openings **29** and **30** are provided transversely in the adapter, extending across the recesses **20** and **21**. Similar openings **31** and **32** are included in the projections **22** and **23** of the router bit **19**. When the projections **22** and **23** are inserted into the recesses **20** and **21**, drive pins **33** are extended through the openings in the adapter and the router bit to hold the router bit to the adapter. The drive pins **33** are compressible transversely, each including rigid elongated portions **35** and **36** of steel interconnected by a core **37** of rubber. When the drive pins are extended through the openings, the resilient layers **37** are compressed, and the drive pins fit snugly within the openings, firmly holding the parts in the assembled relationship.

Extending the length of the router bit **19** along both sides at the top portion adjacent the projections **22** and **23** are lands **38** and **39**. These are connected through convergent walls **40** and **41** to the principal surfaces **42** and **43** of the router bit. When installed, the forward edge **44** of the router bit inclines downwardly and toward the rear, or to the right as the device is shown, while the rearward edge **45** is substantially vertical. The bottom edge **46** extends substantially horizontally between the lower extremities of the forward and rearward edges **44** and **45**.

Along the intermediate portions of the principal surfaces **42** and **43** of the router bit **19** are ribs **47** and **48**. These ribs extend from the lands **38** and **39** to chamfered edges **49** and **50** that interconnect the bottom edge **46** of the router bit. The ribs **47** and **48** are inclined downwardly and to the rear, or to the right as the device is shown. The ribs include outer surfaces **51** and **52**, which are parallel and spaced apart the same distance as that between the lands **38** and **39**. The side edges of the ribs **47** and **48** are divergent laterally from the outer edges **51** and **52** to the lines of joinder with the principal surfaces **42** and **43**.

The blade assembly **15** is made up of a plurality of individual blade elements **54**, which incline forwardly and downwardly from the bottom wall **13** of the scraper bowl. When the router bits **19** are attached to their support adapters **18**, they are located alongside the end edges of the outermost blades **54** of the blade assembly **15**. The inside rib of each router bit becomes positioned almost in contact with the adjacent blade edge. Thus, as seen in FIG. 3, the surface **52** of the rib **48** nearly touches the outer end edge **55** of the adjacent scraper blade element **54**. Because the rib **48** inclines downwardly and to the rear, while the blade unit **54** inclines downwardly and forwardly, the rib and blade cross, so that it is assured that some portion of the rib will overlap the end edge **55** of the blade.

This provides lateral support for the router bit during use of the earthmoving equipment. Laterally inwardly directed forces on the router bit will be transmitted through the rib **48** and its surface **52** to the end **55** of the adjacent blade **54**. Therefore, the blade is able to take out the side loads on the router bit. This is true even though the principal surface **43** of the router bit in the conventional manner is spaced from the end of the blade. With the lateral support afforded by the rib **48**, the router bit will not become damaged or broken from forces pressing it inwardly. Neither will the sidewall **12** of the scraper suffer ill effects from such forces. Therefore, the life of the router bit is increased over conventional designs, and damage to the scraper is avoided.

In the same manner, the router bit **19** on the opposite side of the scraper also is supported against laterally inward forces and will not become broken nor permit the sidewall of the scraper to become bent. The other router bit **19**, however, is supported on its rib **47**, which on that side of the scraper is located adjacent the end of the blade assembly. The rib **47** crosses over the blade, so that engagement is assured.

Thus, by having a rib on either side, the router bit becomes usable on either side of the scraper. It is not necessary to provide special right- and left-hand router bits because of this. Optionally, however, single reinforcing ribs may be provided while sacrificing the advantage of interchangeability at the two sides of the machine.

The rearward inclination given to the ribs **47** and **48** assures that they will be in juxtaposition with the blades of different makes of scrapers. There is some variation in the positioning of the blades on different scraper constructions, but, by having a rearward inclination, in all instances the rib will be adjacent the blade and will transmit inward forces from the router bit to the blade.

The lands **38** and **39** on the router bit **19** are spaced apart a greater distance than that between the opposite surfaces **57** and **58** of the support **18**. This means that, when the router bit is installed, the land on the inner side projects inwardly beyond the surface of the support. As seen in FIG. 3, the land **39** projects inwardly beyond the surface **58** of the adjacent support **18**, while on the opposite side of the scraper the land **38** extends inwardly beyond the surface of the support. This is to relieve the pressure against the inner surface of the support **18** as the scraper is in use. The land **39** deflects the earth away from the surface **58** and relieves the pressure above the router bit, so that any earth that moves alongside the support will be looser. This minimizes the wear on the support **18**. The surface **58** of the support is hardened to further reduce the likelihood of wearing of the support element.

Virtually, the entire lower blade portion of the router bit **19** may be worn away before it is necessary to replace this element. No damage to the support **18** will occur, as the support is not associated with any of the exposed portion of the router bit. Therefore, no matter how severely

the outer portions of the router bit are worn, there will be no effect upon the support.

When it is time for removal of a worn router bit **19**, the pins **33** simply are driven out of their openings in the support and the router bit projections, allowing the router bit to be pulled free. Thus, removal is accomplished very easily and rapidly. New router bits are installed by extending the projections into the wedge-shaped openings and replacing the drive pins **33**. The entire operation takes only a short time and only a brief interruption in the service of the scraper.

The individual blade elements **54** of the scraper are secured to the machine in an arrangement similar to that for the router bits. There is a support member **60** for each of the blade units, provided with wedge-shaped recesses **61** for receiving generally complementary projections **62** of the blade. Openings **63** in the support and **64** in the blade projection **62** receive drive pins **65** that secure the elements in the assembled position. The pins **65** may be similar to the pins **33** described above. With this construction, therefore, the blade elements **54** may be worn completely without risk of damaging the support **60**. The support **60** is entirely beyond the outer section of the blade so that, no matter how much of the blade is worn away, there will be no effect upon the support.

The parts are proportioned so that the upper surface **66** of the blade **54** projects laterally above the upper surface **67** of the support. This relieves the pressure by the earth against the supporting element to minimize any tendency to wear the support. Thus, the compaction of the earth is relieved as it passes from the surface **66** to the lower surface **67** so that the earth is looser and provides less wearing force as it moves inwardly into the scraper body. The surface **67** preferably is hardened to further reduce the wear of this element.

Blade removal and installation is a simple operation involving merely the driving out of the pins **65** and removal of the blade extensions from the recesses **61**, followed by the introduction of a new blade and replacement of the drive pin. Again, therefore, little time is lost in the removal and replacement of the earth-engaging element.

This type of supporting arrangement may be used for other blades or the like and is not restricted to scrapers. The supporting member should have at least two recesses for the receipt of projecting portions from the blade element, with larger blades usually employing three. This increases the strength of the unit by resulting in transverse web portions between the adjacent recesses. These prevent the recessed support from being opened up and distorted outwardly as would occur from the use of a single large elongated recess.

The foregoing detailed description is to be clearly understood as given by way of illustration and example only, the spirit and scope of this invention being limited solely by the appended claims.

I claim:

1. An earth-cutting device comprising:

a generally flat elongated member having opposite longitudinally extending outer edges and opposite principal surfaces,

said member having a support portion adjacent the first of said outer edges,

and a blade portion adjacent the second of said outer edges,

said support portion having an inner part of relatively large thickness and being of relatively smaller thickness at said first outer edge,

whereby said support portion tapers from said inner part toward said first outer edge and is of a generally wedge-shape,

said member having a first pair of elongated enlargements providing ribs extending longitudinally of said member adjacent said inner part of said support portion and intermediate said blade portion and said support portion,

one of said ribs extending outwardly from either principal surface of said member,

said ribs being in opposite alignment with each other,

said ribs having a greater combined thickness than said thickness of said inner part of said support portion,

said member having a second pair of elongated enlargements,

one of said second pair of elongated enlargements projecting outwardly from either principal surface of said member,

said second pair of elongated enlargements being in opposite alignment with each other,

said second elongated enlargements connecting to said first elongated enlargements at an acute angle and extending across said blade portion to said second outer edge of said member.

2. A device as recited in claim **1** in which:

said second elongated enlargements connect to said first elongated enlargements intermediate the ends of said first elongated enlargements,

and said second elongated enlargements extend to said second outer edge intermediate the ends of said second outer edge.

3. A device as recited in claim **2** in which said blade portion has opposite ends, said blade portion being substantially of no greater thickness at said opposite ends than it is inwardly of said opposite ends.

4. A device as recited in claim **3** in which each of said first elongated enlargements includes a side surface inclined toward said second outer edge, said side surfaces of said first pair of elongated enlargements being thereby convergent toward said second outer edge.

5. In combination with an item of earthmoving equipment having spaced upstanding sidewalls, a bottom wall extending transversely between said sidewalls, and a blade at one edge of said bottom wall arranged transversely relative to said sidewalls, said blade being inclined downwardly and presenting an end surface adjacent each of said sidewalls, said end surfaces extending below said sidewalls and being inclined downwardly, a router bit arrangement for said item of earthmoving equipment comprising:

a pair of generally flat members,

each of said members having opposite longitudinal edges and opposite principal surfaces,

each of said members having:

a support portion adjacent the first of said longitudinal edges, and a cutting portion adjacent the second of said longitudinal edges,

and means attaching said support portion to said sidewalls,

each of said members including:

a first pair of elongated enlargements defining a rib along either principal surface of said member,

said ribs being in opposite alignment with each other and extending in adjacency and below the lower edge of the adjacent one of said sidewalls,

and a second pair of elongated enlargements,

said second pair of elongated enlargements being in opposite alignment with each other,

one projecting outwardly from either principal surface of said member,

said second enlargements extending from said first enlargements to the second of said outer edges, and being inclined

in the opposite direction from the inclination of said end surfaces so that said second enlargements cross said end surfaces, one of said second enlargements of each of said members facing and being in juxtaposition with one of said end surfaces for providing support for said member against laterally inwardly directed forces.

6. A device as recited in claim **5** in which said second enlargements connect to said first enlargements intermediate the ends of said first enlargements, and extend to said second outer edge intermediate the ends of said second outer edge.

7. A device as recited in claim **6** in which said support portion tapers in thickness from a relatively thick portion adjacent said first elongated members to a relatively thin portion at said first outer edge, whereby said support portion is generally wedge-shaped, said sidewalls including means defining a recess generally complementarily receiving said support portion, said support portion and said means defining a recess including apertures therethrough, and including pin means extending through said

apertures for providing said means for attaching said support portion to said sidewall.

8. A device as recited in claim **7** in which said relatively thick portion of said support portion is thinner than the combined thicknesses of said first elongated enlargements.

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U.S. Cl. X.R.

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