Dec. 2, 1952 E. L. MILLS ET AL 2,619,787

SICKLE GUARD

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Fig. 1.

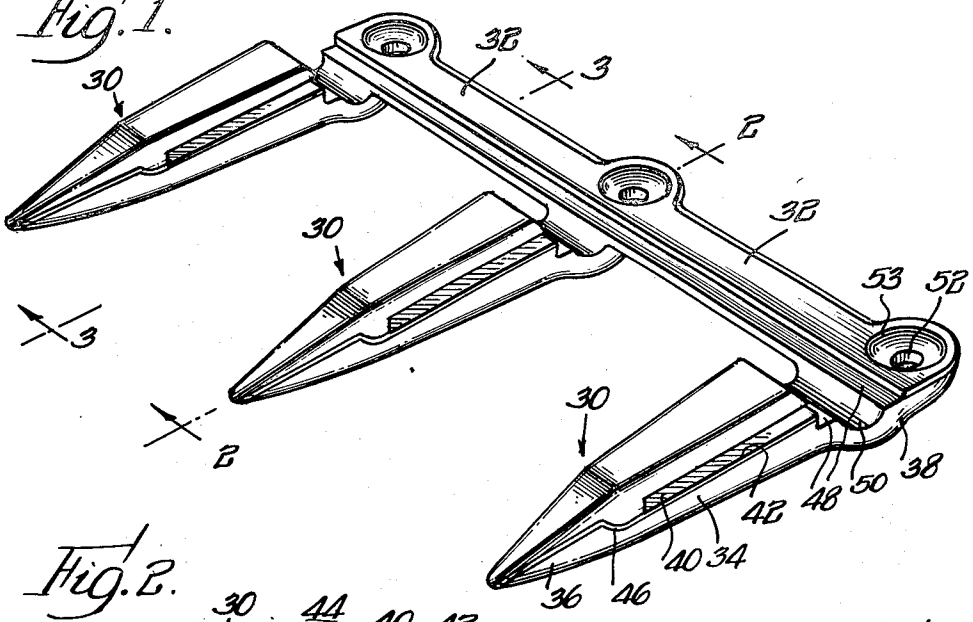


Fig. 2.

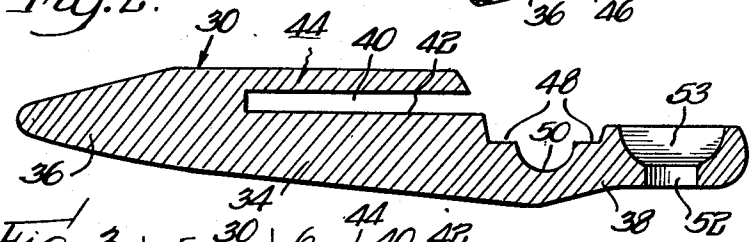


Fig. 5.



Fig. 3.

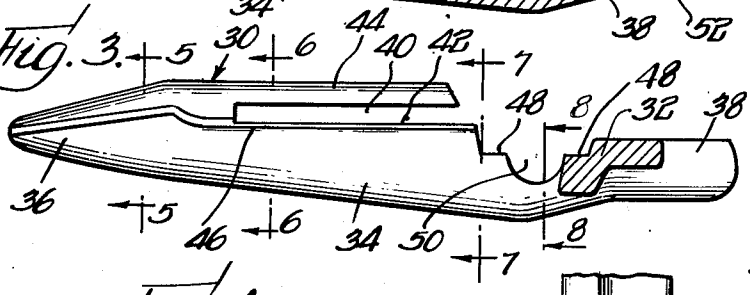


Fig. 6.

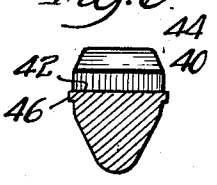


Fig. 4.

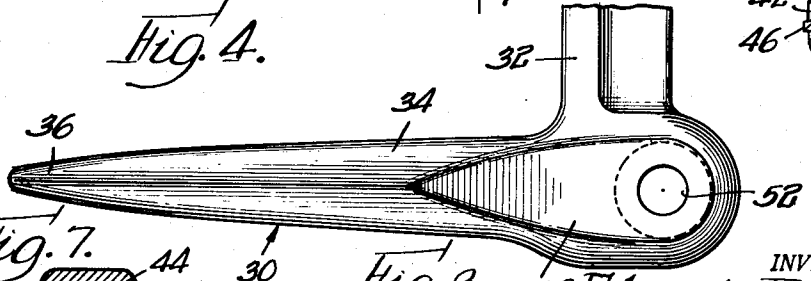


Fig. 7.



Fig. 8.



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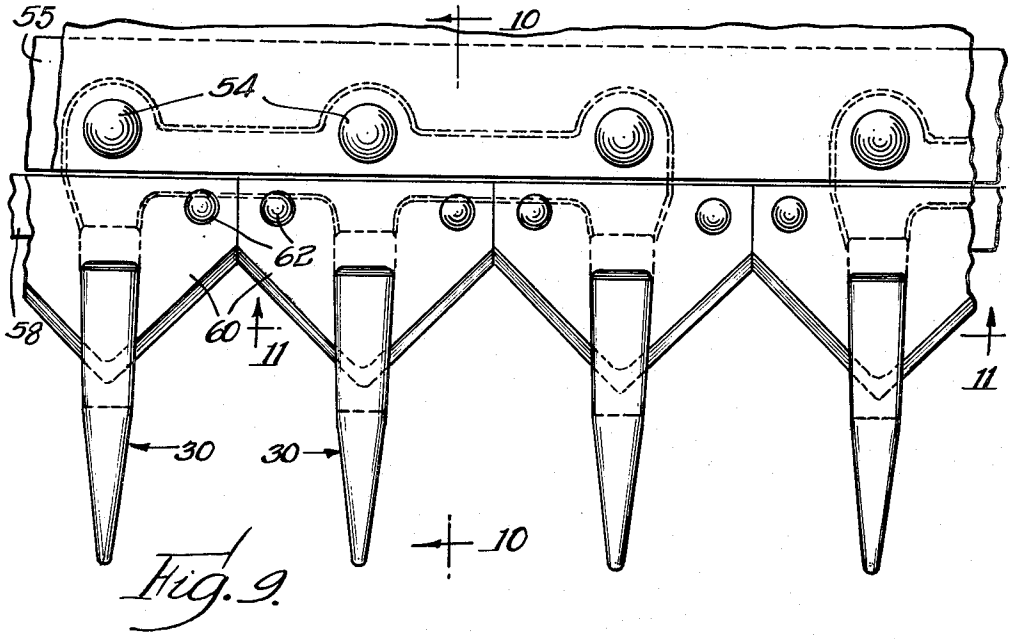


Fig. 9.

Fig. 10.

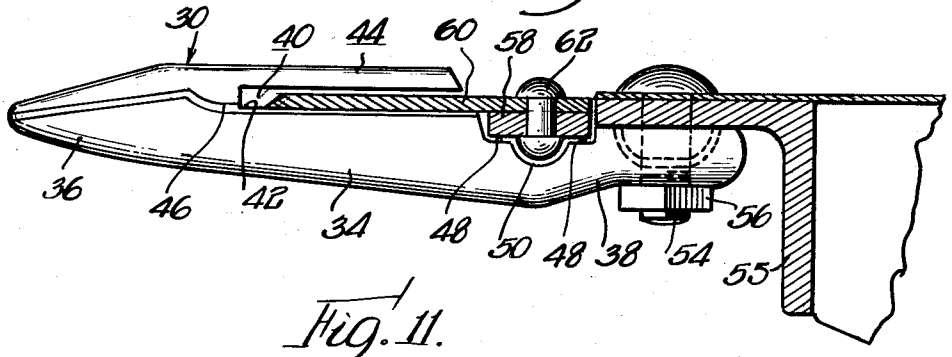


Fig. 11.

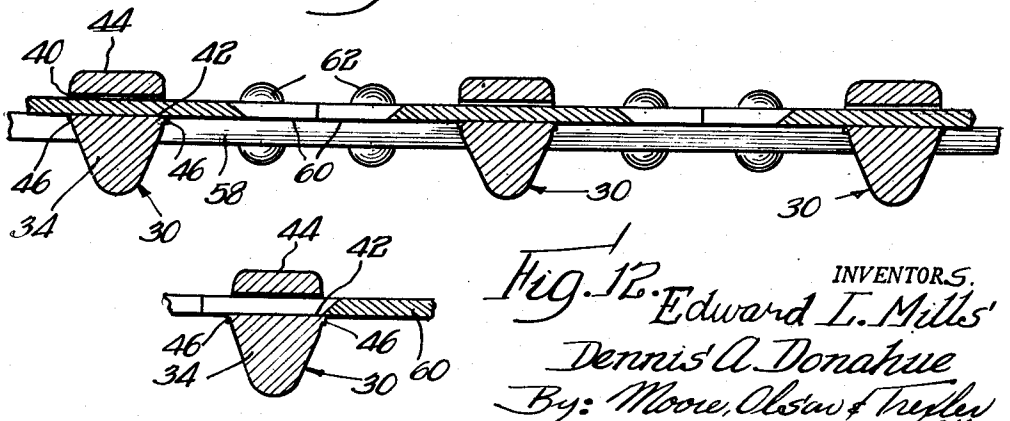


Fig. 12.

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Fig. 13.

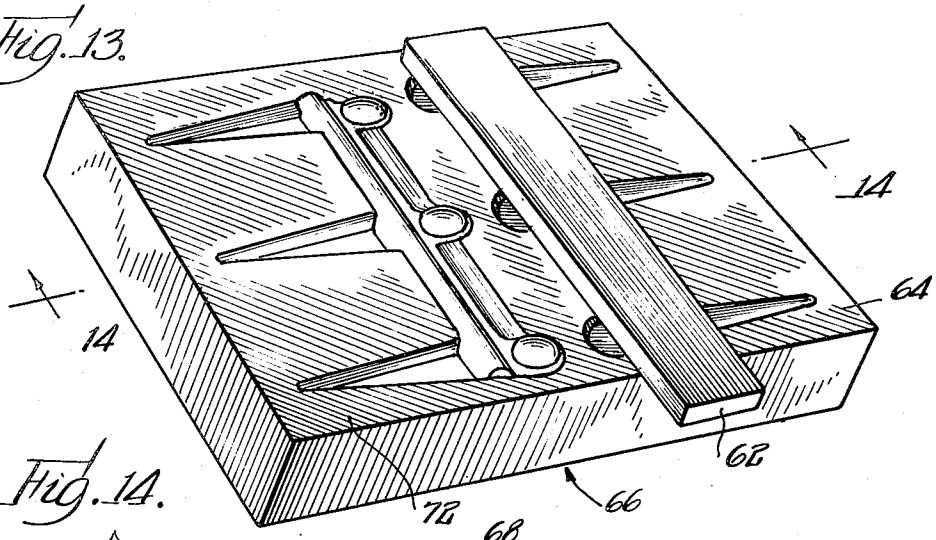


Fig. 14.

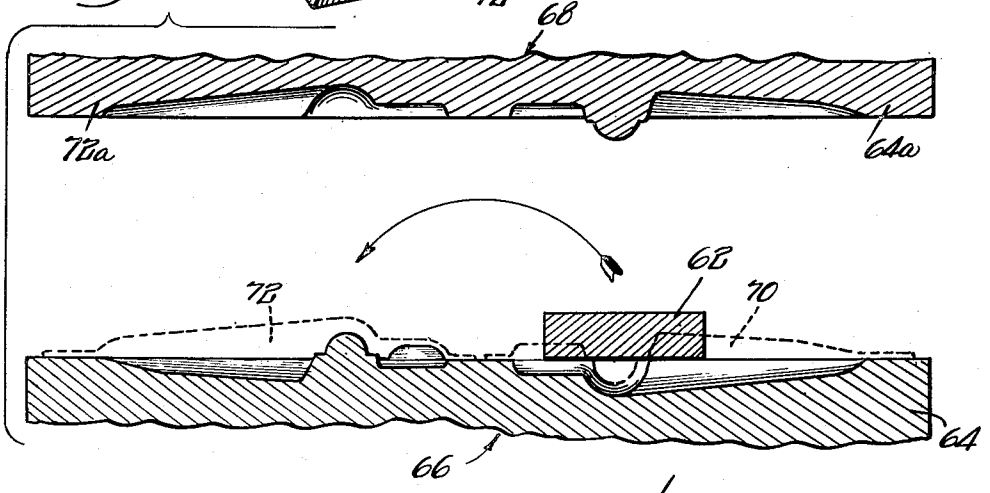
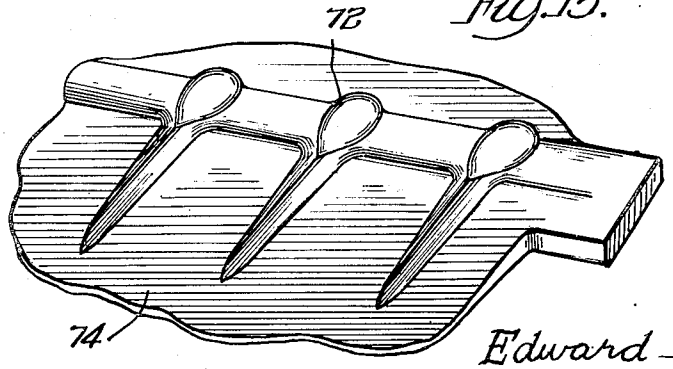


Fig. 15.



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Fig. 16.

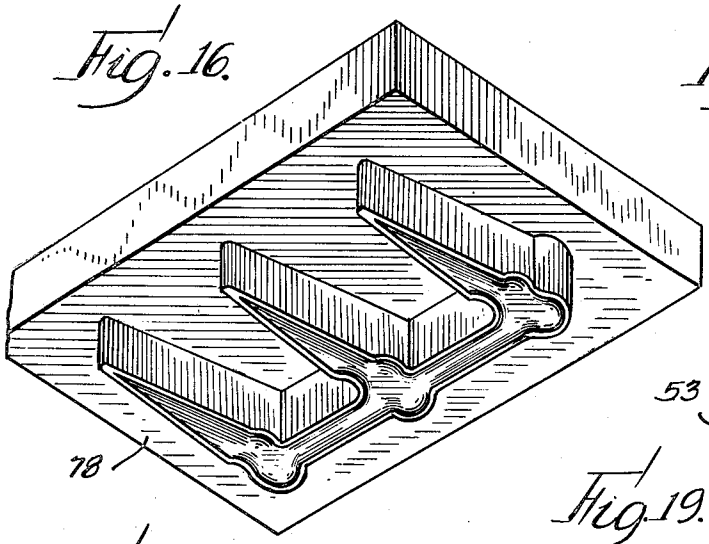


Fig. 17.

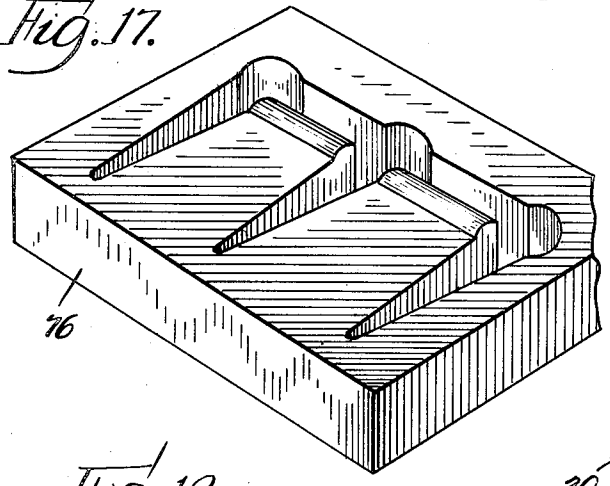


Fig. 18.

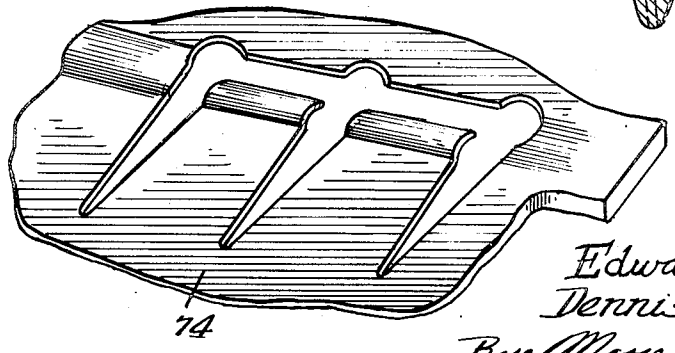


Fig. 19.

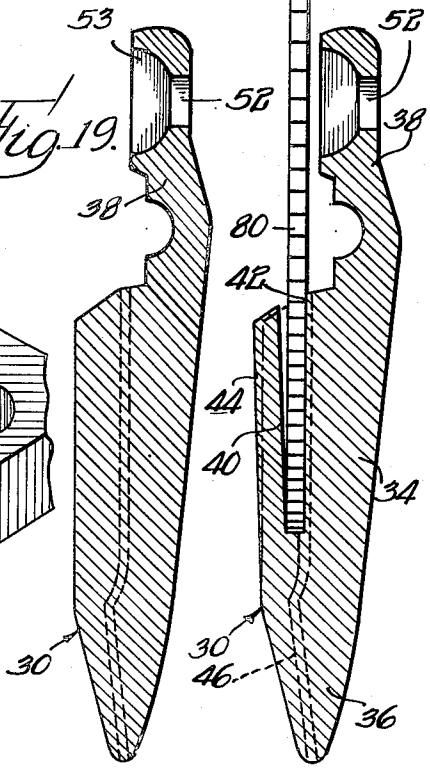


Fig. 20.

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UNITED STATES PATENT OFFICE

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SICKLE GUARD

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Application August 28, 1946, Serial No. 693,516

2 Claims. (Cl. 56—310)

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The present invention pertains in general to cutter guards for mowing machines and, in particular, to improvements in the method of manufacture thereof.

The cutter guards used in mowing machines for cutting grass, grain or the like, may be forged of steel or wrought iron, or may be cast from malleable iron. When a casting is employed it is necessary to provide hardened steel inserts, or ledger plates, along the cutting edges of the guard to preclude rapid wearing thereof. This form of construction is expensive and is furthermore objectionable in that the rivets employed to hold the ledger plates in place frequently loosen and rise up, causing the cutting knives to be lifted from the ledger plates, which prevents proper functioning of the knives. Another objection to the use of castings for the cutter guards is that they are brittle and subject to breakage by stones which may be struck by the mowing arm. When forged cutter guards are used, stones or other obstructions may deform the fingers of the cutter guard but usually will not break them. The deformed fingers may readily be hammered back into shape, oftentimes without even removing the guard from the mowing arm.

The production of a forged cutter guard presents certain difficulties which it is one of the objects of the present invention to overcome. One of the difficulties heretofore encountered lies in the formation of the ledger surface of the guard finger. Inasmuch as the ledger surface is normally inaccessible to the forging dies, due to the lip which extends over such surface, it has been difficult to produce a proper cutting edge without first distorting the lip in such manner as to enable the ledger surface to be reached by the forging dies, after which the lip is bent back in place. In certain instances the lips have been constructed as separate units which are secured to the body portions of the guard fingers subsequent to the forging thereof.

One of the objects of the present invention is to provide an improved cutter guard which is forged in such manner as to produce a cutting edge having the requisite characteristics without the need for deforming the lips of the guard fingers during manufacture.

Another object of the invention is to provide an improved method of manufacturing a forged cutter guard wherein the metal is so worked during the forging of the guard as to produce a grain structure which makes the guard extremely rugged and durable and which results in tough and long-wearing cutting edges.

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A further object of one form of the invention is to provide a cutter guard which is forged in such manner that the parting line of the forging dies coincides with the cutting edges of the guard, whereby an optimum grain structure is obtained along such cutting edges, and wherein a ledge which extends along the cutting edges is provided to facilitate sharpening thereof.

These and other objects of the invention will be more fully understood upon a perusal of the following specification, when taken in conjunction with the accompanying drawings, wherein:

Fig. 1 is a perspective view of the forged multi-finger cutter guard of the invention in its final form;

Fig. 2 is a longitudinal sectional view on an enlarged scale through one of the fingers of the guard shown in Fig. 1, taken along the line 2—2 therein;

Fig. 3 is a sectional view on an enlarged scale through the cutter guard shown in Fig. 1, taken along the line 3—3 therein;

Fig. 4 is a bottom plan view on an enlarged scale of one of the fingers of the guard shown in Fig. 1;

Figs. 5 through 8 are transverse sectional views through one of the finger guards, taken along the lines 5—5 to 8—8 of Fig. 3;

Fig. 9 is an assembly view showing the cutter guard attached to a mower arm with the cutting knives shown in their operating position;

Fig. 10 is a transverse sectional view on an enlarged scale through the assembly shown in Fig. 9, taken along the line 10—10 therein;

Fig. 11 is a sectional view taken transversely to the finger guards along the line 11—11 of Fig. 9;

Fig. 12 is a sectional view similar to Fig. 11 illustrating the manner in which the cutting knives cooperate with the cutting edges of the finger guards to shear the grass or grain being mowed;

Fig. 13 is a perspective view of one of the forging dies used in the production of the cutter guard, with a blank of steel shown in position ready to be forged.

Fig. 14 is a sectional view through the forging dies showing the manner in which the forging is completed in two steps;

Fig. 15 is a perspective view of the completed forging prior to trimming thereof;

Fig. 16 is a perspective view of one of the dies used to trim the forging;

Fig. 17 is a perspective view of the die which

mates with that shown in Fig. 16, and is used in conjunction therewith to trim the forging;

Fig. 18 is a perspective view of the scrap blank which results from trimming of the forging;

Fig. 19 is a longitudinal sectional view through one of the fingers of the guard illustrating the operation of punching mounting holes therein, and

Fig. 20 illustrates the step of sawing slots in the fingers of the guard.

Referring now to the drawings, and in particular to Figs. 1 through 8, the cutter guard comprises a plurality of fingers **30** which are joined together at one end by a bar **32** formed integrally therewith. Each of the fingers includes a body portion **34** which terminates at one end in a pointed nose **36** of triangular cross section and at the other end in a flattened heel **38**. The central portion of each finger has a slot **40** therein forming a ledger surface **42**, upon which the cutting knife rests, and forming a lip **44** which extends over the cutting knife. The lips **44** protect the cutting knives and also serve to hold upright the blades of grass or grain being cut so as to prevent such blades from being folded over the ledger surfaces in place of being sheared off. The cutting knives are generally flat, consequently the slot is preferably wedge-shaped to provide a gradually increasing clearance between the upper surfaces of the cutting knives and the lips **44** from the nose ends of the fingers toward the heel ends thereof, which assists in preventing clogging of this space by the cut grass or grain.

It will be noted that, as shown, the lower side of the slot **40** extends along a ledge **46**, which may be formed along the parting line of the forging dies during manufacture of the guard. One of the purposes of the ledge **46** is to facilitate sharpening of the guard by reducing the amount of metal which must be removed when the guard is ground along the sides thereof in a plane substantially perpendicular to the ledger surface **42**. In instances when such a ledge is not desired, the parting line may extend along the portion of the guard which is subsequently removed by sawing to form the slot **40**. A stronger shearing edge is obtained with the latter construction, while the optimum grain structure produced along the parting line during the forging operations is retained.

A shallow groove **48**, which extends transversely to the fingers **30** along the rear edges of the ledger surfaces **42**, is provided in the guard. This groove is suitably dimensioned to receive a knife bar to which the cutting knives of the mowing machine are riveted. The bottom surface of the groove **48** includes a cylindrical recess **50** which provides clearance for the rivets holding the cutting knives to the knife bar. The guard is provided with a plurality of openings **52**, each aligned with one of the fingers **30** and extending through the heel end thereof. Each of the openings **52** communicates with a well, or cup-shaped depression, **53** formed in the upper side of the guard. The wells **53** are provided to reduce the weight of the forging and to reduce the thickness of the sections through which the openings **52** are punched.

The bar **32** which joins the fingers of the guard has an S-shaped cross section in order to provide proper rigidity to the unit in both horizontal and vertical planes.

The transverse cross section of the body portion **34** of the guard fingers is substantially triangular in form and is of gradually increasing width and depth from the nose ends toward the heel ends of the fingers. From a point substantially in line with the rear edge of the lips **44** and extending to the heel end of the guard, the bottom surface of the fingers is flattened. The portions of the fingers above the ledge or parting line **46** are trapezoidal in cross section and gradually increase in width and depth from the nose ends toward the heel ends of the fingers.

Referring now in particular to Figs. 9 through 12, there is shown a mower arm including a guard supporting rail **55** having a plurality of studs **54** extending therethrough for attaching the cutter guards. These studs pass through the openings **52** in the cutter guards and have nuts **56** threaded thereon and abutting the flattened surface of the guards, thereby rigidly securing them to the rail **55**. It will be noted that by forming a plurality of fingers in a single unit, rather than using individual forgings for each finger, a more rigid mounting is secured in that loosening of any one of the nuts **56** will not appreciably affect the rigidity of the connection of the cutter guard unit to the mower arm. Furthermore, by means of this construction, adequate clearance may be provided between adjacent units to facilitate ready removal or replacement of any one unit without interference from adjacent ones thereof. When individual forgings are used for each finger, and only a single mounting hole is provided therefore, it is necessary to mount the fingers on the mower arm in abutting relation to secure adequate rigidity. When this is done, one of the fingers may be pinched between adjacent fingers in such manner as to preclude ready removal of said one finger.

A knife bar **58**, constituting a part of the mower arm, is shown extending along the forward edge of the rail **55** and lying in the shallow grooves **48** provided in the cutter guards. A plurality of cutting knives **60** are riveted to the knife bar **58** by means of rivets **62**. As previously noted, the lower surface of groove **48** includes a cylindrical recess **50** which provides clearance for the heads of the rivets **62** on the underside of the knife bar **58**.

The cutting knives **60** are shaped in the form of isosceles triangles having the base angles cut off normally to the base lines. The knives are positioned side by side with their apexes in line with the corresponding ones of the fingers **30**, as shown in Fig. 9, to form a continuous serrated cutting edge. The lower surfaces of the cutting knives rest on the ledger surfaces **42** of the guard fingers. The slanting sides of the knives are beveled to provide cutting edges which cooperate with the cutting edges of the fingers to produce a shearing action when the knife bar **58** is reciprocated longitudinally, as illustrated in Fig. 12.

The advantages of the cutter guard may best be appreciated from a consideration of the method by which it is manufactured, the various steps of which have been illustrated in Figs. 13 through 20. First, a steel bar **62**, of a length determined by the number and spacing of the fingers of the guard, is raised to the required forging heat. While a bar having a rectangular cross section is shown, it should be understood that bars having differently shaped cross sections, such as circular, may be employed. The heated bar is then placed over the portion **64** of the lower forging die **66**. The upper and lower dies **66** and **68** are then brought together under great pressure to cause the blank **62** to be formed roughly into the desired shape. The dies are

then separated and the partially completed forging **70** is rotated through 180 degrees into position to be acted upon by the portions **72** and **72***a* of the dies **66** and **68**, as has been illustrated by the arrow in Fig. 14. The dies are then again brought together under pressure to complete the guard forging **72**.

During the forging operation, the greater part of the metal in the blank will be forced into the depressions in the die which correspond to the finger portions of the guard, but a portion of the metal will flow between the surfaces of the dies to form a web **74** which is commonly called the "flash."

It should be noted that the metal is forced to flow principally lengthwise of the finger portions of the guard, but is also forced to flow transversely to the finger portions along the parting line. The grain structure is therefore such as to impart maximum strength to the body portions of the guard and at the same time to produce a region along the parting line which is ideally suited to be formed into a cutting edge.

While the forging **72** is still hot, it is placed over a shearing die **76** which is shaped to conform to the outline of the finished form of the cutter guard, as illustrated in Fig. 17. An upper shearing die **78**, which complements the lower die **76** and is recessed to fit over the forging **72**, is then lowered under pressure to trim the flash **74** from the forging **72**. The portion **74** trimmed from the forging is shown in Fig. 18.

The openings **52** for receiving mounting studs are next punched in the cutter guard at the heel end thereof, as shown in Fig. 19. The wells, or cup-shaped depressions **53**, which communicate with these openings, are formed during the forging operation. After the punching operation, slots are cut in the fingers of the guard to receive the cutting knives of the mowing machine. The slots are cut with a saw, or milling cutter, **80** having straight sides. During the forging operation, the metal is stressed in such manner that the lip portion **44** of the guard fingers springs away from the body portion **34** at the time that the slots are cut. Thus a wedge-shaped slot results, although the slot is cut with a straight-sided saw or milling cutter. If more taper is desired, the lips may be further formed from the ledger surfaces after the sawing operation.

The sawing operation produces a true ledger surface **42** which requires no further finishing. As the side of the body portion **34**, or of the ridge **46**, which may be left on the forging when it is trimmed in one form of construction, is smooth and straight when the forging leaves the trimming dies, a sharp cutting or shearing edge is formed along the junction between the ledger surface **42** and the side of the body portion, or of ridge **46**, when slots **40** are cut in the guard. It is therefore necessary to grind the cutting edge of the guard during manufacture. After the guard has been placed in service and becomes dull, the side of the body portion, or of ridge **46**, may be ground to restore the sharpness of the cutting edge. As the width of ridge **46** is relatively small, the grinding may be accomplished quite rapidly when the form of construction illustrated is employed.

After the slots have been cut in the guard fingers, the cutter guard is subjected to heat treatment to harden the cutting edges. Although the heat treatment may be confined to the region adjacent to the cutting edges, if desired, it is preferred to case harden the whole unit so as to produce a hard abrasion-resisting surface while leaving the core in its original tough and non-brittle state.

It should now be apparent that, by reason of the novel method of manufacture described herein, a cutter guard has been provided which is forged of steel in one piece in such manner as to obviate the difficulties heretofore encountered in the forging of such guards; namely, by sawing a slot in the guard finger along the parting line a tough and durable cutting edge is provided without any need for deforming the guard lip during manufacture.

By forging a multi-finger guard from a bar extending transversely to the fingers, the metal is forced to flow along lines which impart maximum strength and toughness to the guard fingers. At the same time, the flow lines are altered along the parting line, where the cutting edge is subsequently formed by sawing, so as to impart the desired long-wearing characteristics to such cutting edge.

While a particular embodiment of the invention has been shown by way of illustration, it is obvious that various modifications may be made without departing from the invention in its broader aspects, and therefore it is the aim of the appended claims to cover all such modifications as fall within the true spirit and scope of the invention.

The invention is hereby claimed as follows:

1. A cutter guard for use in a mowing machine, said guard being formed of forged steel, said guard having an elongated body portion having a ledger surface along a portion thereof and a lip overlying the same, the guard body portion being provided at its opposite sides and along the margins of said surface with cutting edges, said guard body portion having at its opposite sides a parting line region resulting from a forging operation and having the said cutting edges lying in said region, whereby said guard body portion will have grain lines running longitudinally interiorly thereof and transversely thereof at said cutting edge portion.

2. A cutter guard as claimed in claim 1, wherein at least a portion of said region extends laterally from the guard body portion to provide ledges on which the said cutting edges are disposed.

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