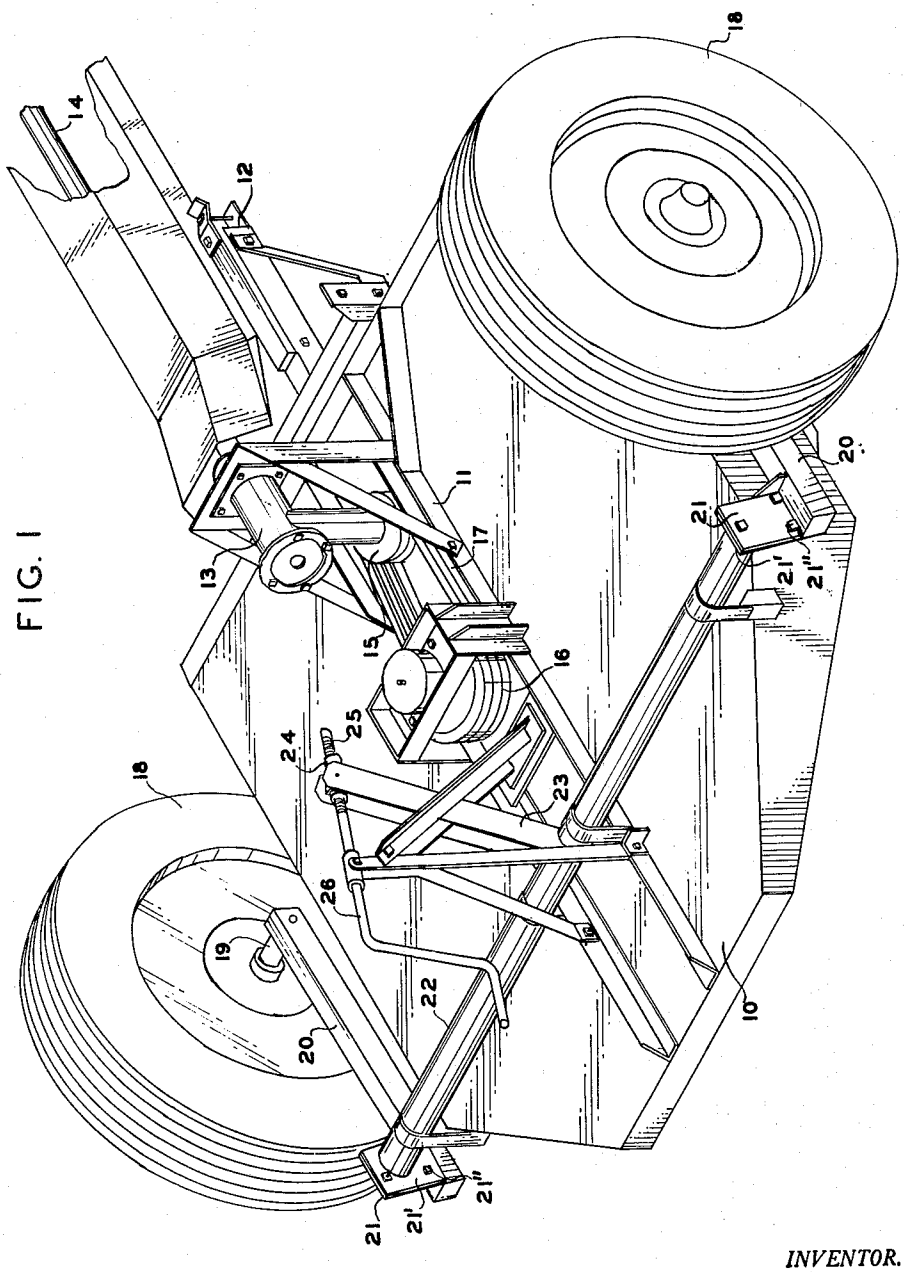
Sept. 5, 1961 J. C. BOESCH, JR 2,998,689

ROTARY CUTTER

Filed April 3, 1957 2 Sheets-Sheet 1

FIG. 1



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ROTARY CUTTER

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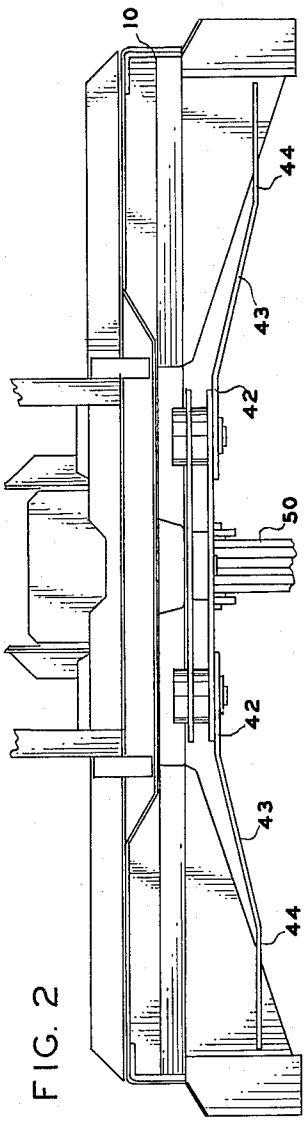


FIG. 2

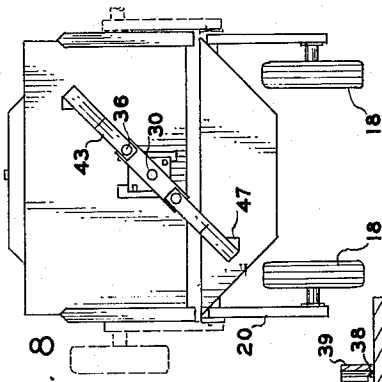


FIG. 8

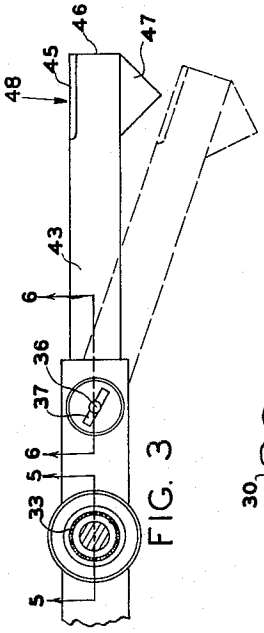


FIG. 3

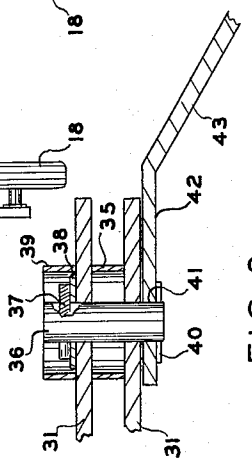


FIG. 6

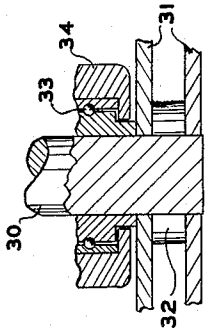


FIG. 5

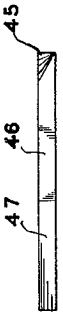


FIG. 4

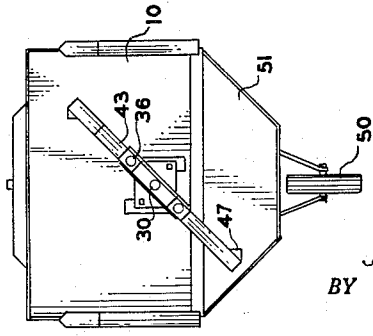


FIG. 7

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United States Patent Office 2,998,689 Patented Sept. 5, 1961

2,998,689

ROTARY CUTTER

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Filed Apr. 3, 1957, Ser. No. 650,503
11 Claims. (Cl. 56—25.4)

This invention relates to agricultural implements and is particularly concerned with rotary bladed mowers, cutters, beaters and the like.

The present invention provides apparatus of simple, rugged and durable structure, including novel and improved wheel mountings by which the cutter blade height may be quickly and easily adjusted and by which the wheel disposition with respect to the swath cut may be varied. An important feature of the invention also resides in the design, construction and arrangement of the cutter, beater or mowing blades by which a novel and improved action is provided.

Among the problems encountered in rotary bladed devices of the character described is that of the delivery of adequate force at the point of contact of the blades with the crop. With simple blade constructions in which the blade is of uniform weight and cross-section throughout its length, it has been found that the impact force diminishes as the blades progresses outwardly from its hub. Obviously, the effectiveness and the efficiency of such devices is dependent upon the location of the center of percussion or impact force and a maximum impact force is of course desirable at the point of engagement of the blade with the material to be cut, beaten or mowed. Heretofore, in order to provide a cutting edge and to diminish overall weight of the cutter, the blades have been commonly designed with diminishing cross-section and hence diminishing weight outwardly from their motivating hub. While the demands for lightweight and low driving power have thus been met, they have been so met at the expense of the location of the impact or percussion force which is most effectively applied at the cutting edge which is located at the outer end of the blade. Such blades have also commonly been formed rigidly with the hub. In such case, upon contact of the cutter with material resisting cutting action the blade is apt to be broken or damaging shock transmitted back to the driving mechanism.

In the light of the above problem, it is among the general objects of the present invention to provide novel and improved apparatus of the character described which will effectively and efficiently carry out the operation for which such apparatus is desired.

It is a further object of the present invention to provide a novel and improved structural arrangement including readily adjustable means for controlling the elevation of the cutter with respect to the surface over which it travels.

The invention also includes among its objectives that of providing selective wheel disposition so as to permit wheels to be located in such manner as to traverse the swath already cut or to be moved to an axis substantially normal to the axis of the cutter drive.

It is also an important object of the present invention to provide a novel and improved blade design and construction by which a maximum impact force is provided at the cutting edge of a rotary blade.

Another object of the invention is to provide a cutter having means readily yieldable upon impact of the blade with an object resisting the action thereof so as to preclude the breaking of the blade in response to such impact.

It is also among the objects of the present invention to provide a cutter blade designed in accordance with well established rules of mechanical force such as to effectively utilize the laws of mass motion and centrifugal force to

the end that improved effectiveness and efficiency will result.

Numerous other objects, features and advantages of the present invention will be apparent from consideration of the following specification taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a perspective view of an agricultural implement embodying the present invention.

FIG. 2 is a fragmentary front elevation of a device of the general type shown in FIG. 1 illustrating in detail the mounting and construction of the blade element.

FIG. 3 is a fragmentary top plan view of the cutter blade of the present invention.

FIG. 4 is an end elevation of the blade as shown in FIG. 3.

FIG. 5 is a detail cross-sectional view of the mounting of the cutter hub as taken on line 5—5 of FIG. 3.

FIG. 6 is a detail cross-sectional view taken on line 6—6 of FIG. 3, showing the free mounting of the blade.

FIG. 7 is a bottom plan view of a modified form of the invention.

FIG. 8 is a bottom plan view of the device of FIG. 1 illustrating the selective positioning of the wheels.

With respect to the structure of the body, wheels and mounting of the present device, it may be generally stated that the apparatus includes draft means by which it may be secured and motivated by a conventional farm tractor together with drive means operable from the power take-off of the tractor for rotating a cutter in a horizontal plane beneath the body of the device. The apparatus also provides an improved wheel mounting and adjustment therefor, the wheels being supported on wheel tongues which in turn are mounted on an adjustably oscillating cross bar. This arrangement is such that oscillating of the cross bar will vary the angular position of the tongues and hence the vertical relation of the wheels with respect to the body to control the height of the cutter from the surface over which the device travels. This feature of the invention also provides ready means for converting the apparatus from a structure in which the wheels are disposed on either side of the body approximately parallel to the cutter drive to one in which the wheels may be disposed in rearward trailing position with respect thereto and in the path cut by the cutter. A modified form of the invention provides a structure with a single trailing wheel in lieu of the pairs of side or trailing wheels.

The cutter construction of the present invention may be generally defined as including a rotatably mounted cutter hub adapted to be driven from a source of power above the body of the vehicle. The hub of the preferred form of the invention is of composite construction preferably including a pair of spaced hub arms which extend radially outward. At the extremities of the hub arms, there are freely mounted for unlimited rotation with respect thereto cutter blades characterized by a design incorporating added weight at the terminal end of the blade which constitutes that portion of the blade adapted to engage the material to be cut, mowed or beaten. By this arrangement, it will be seen that the center of percussion following the laws of mass motion and force will provide for a maximum impact at the cutting edge of the blade where it is most effective.

Referring now particularly to FIG. 1 of the drawings, it will be seen that the structure of the present device includes a generally horizontal flat and rectangular body **10** suitably braced and supported by structural angle irons as indicated at **11**. Projecting forwardly from the body, there is a draft mechanism indicated at **12** together with a gear housing **13** for receiving a drive shaft **14** and communicating rotary motion therefrom to a drive pulley **15**. Rotation is imparted to the cutter mounted beneath the

body 10 and hereinafter discussed in detail by a pulley 16 driven by belt 17 from the pulley 15.

The body of the apparatus is supported from wheels 18 mounted upon axle pintles 19 which extend outwardly from relatively horizontally disposed axle tongues 20. Plates 21' are fixed to the ends of tongues 20 and these plates 21' are securely mounted against plates 21 by means of bolts 21''. The plates 21, in turn, are fixed to the opposite ends of an oscillatingly adjustable cross bar 22. Oscillation of bar 22 is controlled by rigidly secured arm 23 affixed thereto. The free end of arm 23 is secured to a traveling nut 24 mounted on the threaded extremity 25 of an adjustment crank 26. It will of course be understood that as the adjustment crank 26 is rotated, the nut 24 will travel longitudinally of the threaded portion 25, thus moving the arm 23 to vary the oscillated adjustment of the shaft 22 and thus swing the tongues 20 about the shaft as its axis to raise and lower the wheels 18.

It will further be noted that by the construction here presented, the wheels may be readily moved from the position shown in FIG. 1 substantially centrally of either side of the body to a rearward trailing position within the path cut by the cutter by removing the three securing bolts 21'' securing plates 21 and 21' together and by turning the tongues so that they trail the bar 22 and their pintles point inward as shown in full lines in FIG. 8. Re-attachment of the bolts 21' through both plates in such rearwardly extending position of the tongues rather than the forwardly extending position shown will cause the wheels to track the cut. By such conversion, it will be seen that the elevation of the body may be altered by rotation of the crank 26 in the same manner as herein described with respect to such adjustment when the wheels are in the position shown in FIG. 1.

Referring now more particularly to FIGS. 2 to 6, inclusive, it will be seen that there is mounted beneath the body 10 and on the downwardly extending power shaft 30 driven from the pulley 16 a blade structure including a pair of parallel flat blade hub pieces 31 spaced by circular hollow spacing collar 32. The blade hub pieces are rigidly secured with the shaft 30 preferably in abutment with the inner race 33 of a shaft bearing within the housing 34. For economy and simplicity of construction, design and assembly, the blade hub pieces 31 may conveniently be formed of simple, flat strap material such as steel. The hub pieces 31 extend radially outwardly from the shaft 30 for a distance which may be dictated by the particular operation for which the device is designed, here shown as approximately somewhat less than one-half of the total radial extent of the blades from the hub. At the outer end, the blade hub pieces 31 are spaced by a collar 35 similar to the collar 32 and are united by bolt 36 secured by transverse pin 37 together with a washer 38 located in a guard ring 39.

The lower end of the pin 36 is formed with a head 40 and the pin extends upwardly therefrom through an aperture 41 at the inner terminal end 42 of the blade proper. The fit of the aperture 41 over the pin 36 adjacent the head 40 thereof is loose, permitting free rotary motion of the blade with respect to the pin 36 and thus in free pivotal relation to the hub pieces 31. Outwardly from the inner end 42, the blade includes an intermediate downwardly inclined portion 43 terminating in a horizontal flat outwardly projecting cutting portion 44 provided on one edge with a sharpened blade cutting or beating area 45. In direct alignment with the area 45 and adjacent the outer terminal end 46 of the cutting portion, the blade is provided with a rearwardly extending weight portion 47, here shown as a triangular rearward extension of the blade.

By this construction, it will be seen that the portion 47 provides for a maximum cross-section and hence maximum weight of the blade at the outer cutting end thereof. It will be understood that by the well known basic formula:

$$L=\frac{I}{MXo}$$

where L is the distance from the axis of suspension to the center of percussion, I is the moment of inertia of the blade or beater about its axis of suspension, M is total mass of the blade or beater and Xo is the distance from the axis of suspension to the center of gravity of the blade or beater, increasing the mass by using a larger section of material does not influence the center of percussion, but that it is judicious positioning of additional mass to an otherwise homogeneous consistent section of material that modifies the distance to the center of gravity and the moment of inertia, which repositions the center of percussion. It is further seen that with the addition of a given weight, the center of percussion can be brought to practically coincide with any practical area of impact. Thereafter, additional weight serves primarily to increase the kinetic energy available at the point of impact. This further addition is governed by the nature of the material being cut or beaten, hence the desired impact for satisfactory function.

From the above consideration, it will be seen that the center of percussion 48 of the blade is moved outwardly to be effectively applied at the cutting tip and that by such location of the center of percussion, the impact is maximum at the place where such impact is to be applied. In considering this feature of the invention, it will of course be understood that the invention is not limited to the specific structural arrangement by which the weight of the blade is brought into alignment with the cutting tip portion. It will also be noted in considering this feature of the invention that the provision of increased weight at the outer terminal end of the blade provides for increased effectiveness and efficiency of centrifugal forces applied to the blade, and hence it is possible to provide the free loose mounting of the blade proper on the outer portion of the hub pieces so as to permit the blade to yield in its mounting with respect to the hub upon impact with a non-yielding object. Nevertheless, by virtue of the weighted tip of the blade, centrifugal force will maintain the blade in alignment with the hub pieces to effectively maintain a cutting disposition thereof.

By reference to FIGS. 2 and 7 of the drawings, it will be noted that as an alternative construction, a single centrally located wheel 50 may be mounted at the outwardly extending frusto-triangular portion 51 of the body 10.

From the foregoing, it will be seen that the invention provides a simple, rugged and durable structure together with a novel and improved wheel adjusting means, and a blade structure of new and improved design effectively and efficiently distributing the weight thereof to provide registration of the center of percussion with the cutting portion of the blade so as to insure the best impact pressure. It will be noted that the invention is not limited nor confined to the specific structural details here presented, and thus numerous changes, modifications and the full use of equivalents may be resorted to in the practice of the invention without departing from the spirit or scope thereof as defined in the appended claims.

I claim:

1. In a rotary blade for an agricultural apparatus, a cutting area on said blade, and means on said blade locating the center of percussion at the cutter area thereof.

2. In a rotary blade for an agricultural apparatus, a cutting area on said blade, and means on said blade locating the center of percussion at the cutting area thereof, said means comprising an increase of blade mass approximately at the cutting area.

3. In a rotary blade for an agricultural apparatus, a cutting area on said blade, and means on said blade locating the center of percussion at the cutting area, said means comprising an increase of blade mass approximately at

the cutting area provided by an increase in blade width at such area.

4. In a rotary blade for an agricultural apparatus, a cutting area on said blade, and means on said blade locating the center of percussion at the cutting area, said means comprising an increase of blade mass approximately at the cutting area provided by an increase in blade width formed by an extension of the blade behind the cutting area.

5. In a rotary blade for an agricultural apparatus, a cutting tip on said blade, and means on said blade locating the center of percussion at the cutting tip, said means comprising an increase of blade mass approximately at the cutting tip thereof provided by an increase in blade width formed by a triangular extension of the blade behind said cutting tip.

6. A rotary blade assembly for agricultural apparatus including a driven hub comprising spaced hub pieces, and a blade member pivotally mounted beneath said hub pieces for disposition under centrifugal force substantially radially outward of said hub, said blade member having an intermediate downwardly inclined portion adjacent said pivotally mounted portion and a horizontally projecting portion outwardly thereof.

7. A rotary blade assembly for agricultural apparatus including a driven hub comprising spaced flat strap hub pieces, and a blade member pivotally mounted beneath said hub pieces for disposition under centrifugal force substantially radially outward of said hub, said blade member having an intermediate downwardly inclined portion adjacent said pivotally mounted portion and a horizontally projecting portion outwardly thereof.

8. A rotary blade assembly for agricultural apparatus including a driven hub comprising spaced flat strap hub pieces, and a pair of blade members pivotally mounted respectively beneath said hub pieces for disposition under centrifugal force substantially radially outward of said hub, cutting tips on said blade members, said members being of increased mass at their extremities sufficiently to bring the center of percussion within the cutting tips of said blade members, said blade members having intermediate downwardly inclined portions adjacent said pivotally mounted portions and horizontally projecting portions outwardly thereof.

9. In an agricultural apparatus, a body, wheels supporting said body, draft means for said body, a power drive, a vertical shaft driven by said power drive and extending through said body, and a rotary blade assembly mounted on said shaft below said body, said blade assembly including a hub and blades loosely pivoted to said hub, a cutting end on each said blade, each blade including a weight at the cutting end thereof of sufficient magnitude to locate the center of percussion within the impact area of such ends.

10. In an agricultural apparatus, a body, wheels supporting said body, draft means for said body, a power drive, a vertical shaft driven by said power drive and extending through said body, and a rotary blade assembly mounted on said shaft below said body, said blade assembly including a hub and blades loosely pivoted to said hub, a cutting tip on each said blade, each blade including a weight at the cutting tip thereof formed by a portion of increased width of sufficient magnitude to locate the center of percussion at the impact area of the cutting tip of said blade.

11. In an agricultural apparatus, a body, wheels supporting said body mounted upon angularly adjustable tongues secured to an oscillatingly adjustable bar secured transversely of said body, draft means for said body, a power drive, a vertical shaft driven by said power drive and extending through said body, and a rotary blade assembly mounted on said shaft below said body, said blade assembly including a hub and blades loosely pivoted to said hub, an outer cutting tip on each said blade each blade including a weight at the outer cutting tip thereof formed by a portion of increased cross-section sufficient to locate the center of percussion substantially at the impact area of the cutting tip of said blade.

References Cited in the file of this patent

UNITED STATES PATENTS

2,167,222	Shelor	July 25, 1939
2,263,368	Sejkora	Nov. 18, 1941
2,427,265	Dreischerf	Sept. 9, 1947
2,564,201	Hainke	Aug. 14, 1951
2,592,991	Yeager et al.	Apr. 15, 1952
2,634,571	Lawrence et al.	Apr. 14, 1953
2,654,986	Gold	Oct. 13, 1953
2,669,084	Warren	Feb. 16, 1954
2,743,565	Dow	May 1, 1956
2,786,322	McEvers	Mar. 26, 1957
2,816,410	Nobles	Dec. 17, 1957
2,818,269	Northcote et al.	Dec. 31, 1957
2,821,831	Thompson	Feb. 4, 1958