United States Patent

[11] **3,566,943**

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[54] **RECUTTER SCREEN**
3 Claims, 8 Drawing Figs.

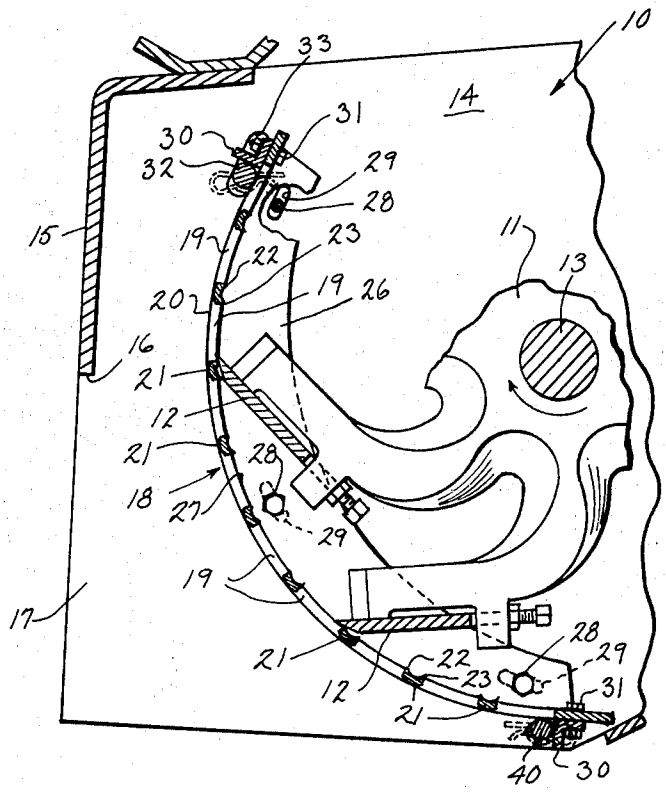
[52] **U.S. Cl.** **146/117,** 146/107, 241/88
[51] **Int. Cl.** **B02c 18/00**
[50] **Field of Search** 146/117, 107L, 107T; 241/88, 73, 89

[56] **References Cited**
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1,286,757	12/1918	Patterson	241/88
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Primary Examiner—Willie G. Abercrombie
Attorney—Morsell and Morsell

ABSTRACT: A recutter screen for use in connection with cylindrical cutters having rectangular openings separated by bars, those bars which extend axially of the cutter having inwardly offset edges to provide shearing knives for coaction with the blades of the cutter, the screen being adjustably mounted against adjustable crescents on the end walls of the cutter frame and being readily reversible to present an alternate set of shearing edges when one set becomes worn.



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Fig. 1

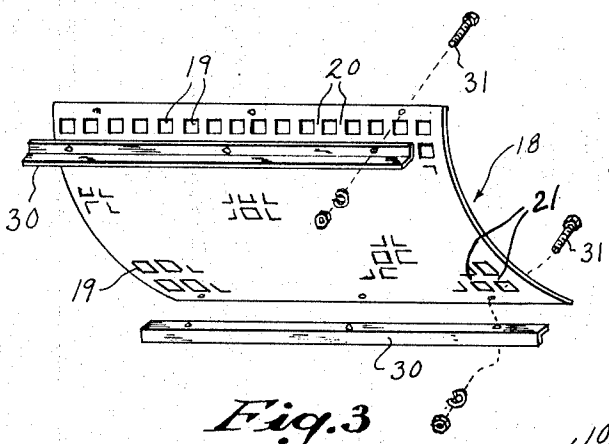


Fig. 2

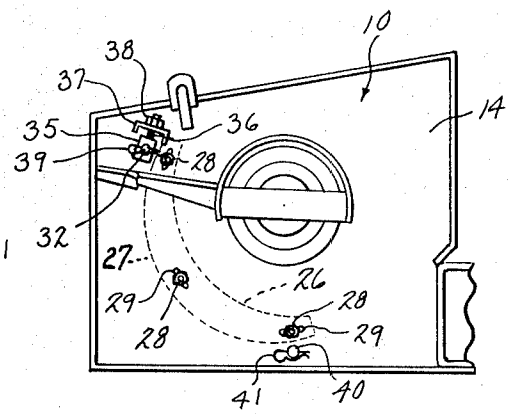


Fig. 3

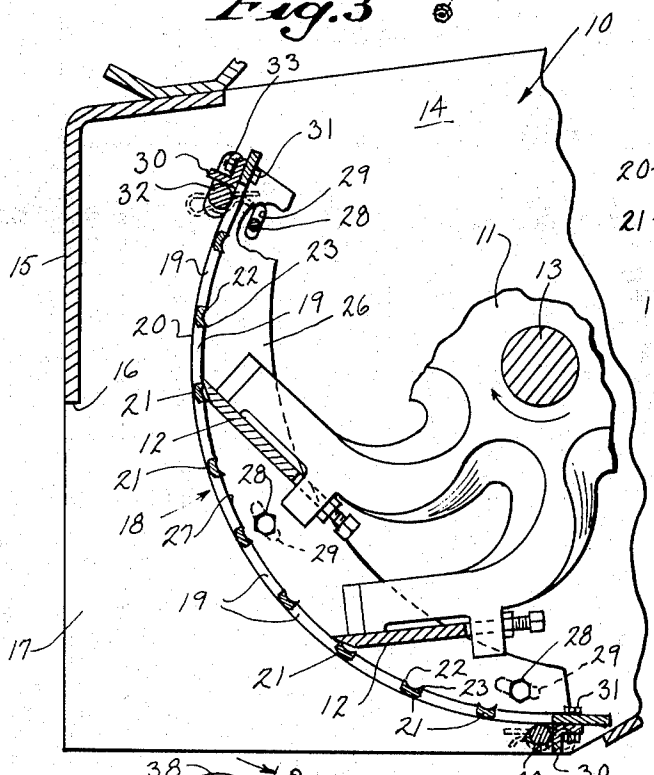


Fig. 4

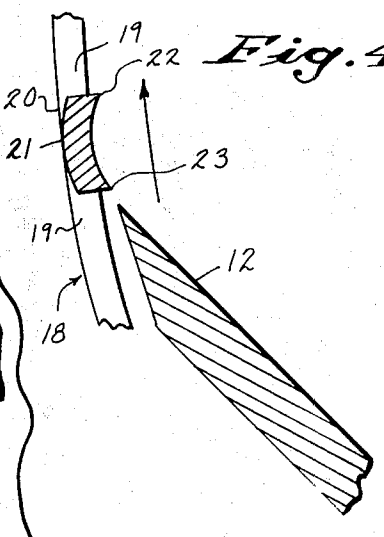


Fig. 5

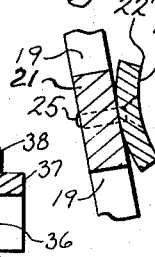


Fig. 6

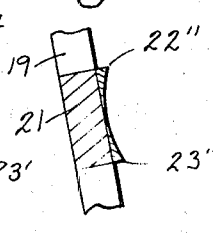


Fig. 7

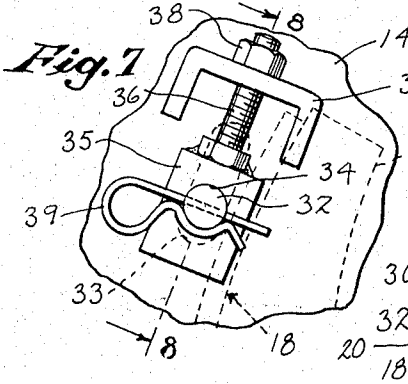
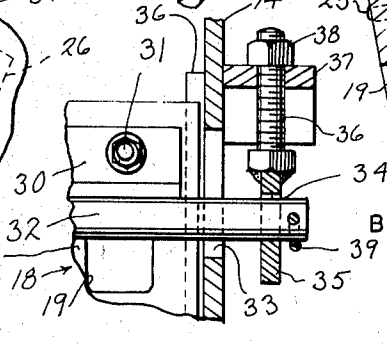


Fig. 8



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RECUTTER SCREEN

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention pertains to recutter screens used in conjunction with stationary feed grinders or in conjunction with the cylindrical cutters of a forage harvester.

2. Description of the Prior Art

Recutter screens have heretofore been used in conjunction with feed grinders and in conjunction with the cylindrical cutters of forage harvesters. These screens are fitted close to the proximity of the knives and have holes to retard the flow of material through the knife cylinders, causing the material to be recut. Screens as heretofore used are objectionable in that the knives drag over the entire surface of the screen, thus causing the use of excessive power to rotate the reel and reducing the efficiency. Louvered openings have been used in screens for hammermills such as in U.S. Pat. No. 2,215,226, but here the louvers are formed from the material of the openings and not by bending metal which forms the bars between openings. Such louvered openings are also suggested in U.S. Pat. No. 1,359,246. In Whitmore U.S. Pat. No. 3,090,568 the screen is corrugated with the knives coacting with such corrugations. Here again, however, there is no thought of inwardly offsetting the bars between openings.

SUMMARY OF THE INVENTION

The present invention provides a recutter screen having a plurality of rectangular openings separated by bars, the edges of those bars which extend axially of the cylindrical cutter being inwardly offset to provide stationary shearing knives for coaction with the rotating knives. Thus, in operation, the rotating knives coact only with inwardly offset edges, and do not have to drag over the entire surface of the screen in order to obtain a proper cut. It is a further feature of the invention to provide a screen which is reversible, so that in one position of installation only those shearing edges which are on one edge of the axial bars are employed. The screen, however, is readily reversible so that after one set of cutting edges becomes worn another set may be brought into operative position. In addition, there is a novel mounting arrangement which provides for quick reversal of the screen and also for accurate adjustment of the screen to bring a set of stationary knives into proper relationship with the rotating knives.

BRIEF DESCRIPTION OF THE DRAWING

In the accompanying drawing, illustrating several embodiments of the invention, in which the same reference numerals designate the same parts in all of the views:

FIG. 1 is a perspective exploded view showing a recutter screen with a pair of retainer bars about to be connected to opposite edges of the screen;

FIG. 2 is an end view of a housing for a cylindrical cutter such as the cutter of a forage harvester showing the invention incorporated therein;

FIG. 3 is a fragmentary transverse sectional view through a cutter with the recutter screen installed in operative position;

FIG. 4 is a fragmentary enlarged view showing one of the axially extending bars of the recutter screen with its axial edges offset inwardly toward the rotating knife;

FIG. 5 is a similar view without the rotating knife, showing a modification;

FIG. 6 is another similar view showing another modification;

FIG. 7 is a fragmentary view looking at a portion of the end of the cutter housing, showing the means for adjustably anchoring the upper attachment rod; and

FIG. 8 is a fragmentary longitudinal sectional view through the mechanism of FIG. 7, showing a portion of the recutter screen and upper anchoring rod.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now more particularly to FIG. 3 of the drawing, the numeral 10 generally designates a cylindrical cutter of the type used in forage harvesters, the said cutter having a reel 11 provided with adjustable knives 12. The reel is mounted on a shaft 13 which is suitably driven and journaled in end walls 14. Extending along the upper portion of the discharge side of the cutter is an upper front plate 15 which terminates at 16 to provide an opening 17 through which cut material may be discharged.

The recutter screen is formed of sheet metal, the major portion of which is curved in a true arc concentric with the axis of shaft 13 (usually an 8 to 14 inch radius in the case of a forage harvester), as is clear from FIG. 3, so that the screen may be readily reversed. Portions of the screen near upper and lower edges, where the bars 30 are mounted, may be tangential for a short distance. The screen is provided with a plurality of rectangular openings 19 separated by transversely extending bars 20 and by axially extending bars 21. For one typical type of usage the openings are 1½inches square. They may, however, be smaller or as large as 6 inches square depending upon the material being cut. These screens are preferably formed by stamping and punching sheet metal in a manner to cause the metal of the openings to be punched out and removed and to cause simultaneous inward bending or offsetting of the edges 22 and 23 of each of the bars 21 to thereby provide fixed shearing blades as shown in FIG. 4. The offsetting is preferably performed so that the corners 22 and 23 of the bars are on a one-fourth inch radius, with said corners offset inwardly one-sixteenth of an inch from the screen. After stamping, the screens are heat treated along the bars 21 so as to harden the offset cutting edges 22 and 23. As an alternative, although substantially more expensive, the inwardly offset edges could be formed as shown at 22′ and 23′ in FIG. 5 by the connection of heat treated removable strips 24 which may be removably secured in position by bolts 25 or by any other suitable means. As another alternative, the inwardly offset edges may be formed as shown at 22″ and 23″ in FIG. 6 by suitably affixing a selected abrasive resistant material to the inner portions of the bars 21 adjacent the edges.

In use, only the lower set of shearing edges 23 of FIG. 3 coacts with the knives 12 to perform the cutting function. It is an important feature of the present invention that when the edges 23 become worn the screen be reversible so that the other edges 22 may be brought into operative relationship with the rotating knives. During rotation of the knives, with the screen installed as in FIG. 3, the stationary cutting edges 23 are in an opposing position with respect to the direction of rotation of the rotating knives to act as stationary cutting blades. These edges 23 will eventually become dulled. While the rotating knives will cause some wear on the other edges 22 they do not meet these edges head on so such wear of these edges 22, because they face in the direction of rotation of the knives 12, will not cause them to lose their sharp edges. It is therefore another important feature to provide a simple means for quickly reversing the screen 18 and for quickly bringing it into a properly adjusted reversed position so that the other set of edges 22 may be employed for cutting.

In order to accomplish the above purpose, a flat crescent shaped piece of metal 26 is removably and adjustably connected to the inner face of each of the end walls 14. Each crescent has sufficient thickness to provide a curved abutment edge 27 against which the recutter screen is adapted to seat. The crescents are secured in position by bolts 28 which extend through holes in the crescents and through slotted openings 29 in the end walls. The slots thus provide for adjustment of the crescents.

Angle bar retainers 30 are secured adjacent opposite longitudinal edges of the recutter screen in the manner shown in FIG. 1, preferably by nuts and bolts 31. With these angle bars in position a recutter screen may be dropped in from the top

and then turned around with the knife cylinder and manipulated into position. An upper rod **32** is then inserted through slotted openings **33** in the end walls (see FIG. **8**), with its ends projecting through the end walls and through openings **34** in blocks **35** which are adjustably supported by screws **36** which adjustably depend through U-brackets **37** (see FIG. **7**). The U-brackets are suitably welded to the end walls of the cutter housing as shown in FIGS. **7** and **8**. By manipulating the nuts **38**, the bolts **36** will pull up on the blocks **35** to vary the position of the rods **32**. Pin clips **39** are passed through holes in the projecting ends of the rod **34** to prevent axial movement thereof.

The lower portion of the recutter screen is removably held in position by a similar rod **40** which coacts with the lower angle bar retainer **30**. The lower rod extends through openings in the end walls of the cutter housing and is removably held in position by pin clips **41** which are passed through holes in the rod. By adjusting the position of the crescents, through manipulation of the adjustment bolts **28** which coact with the end wall slots **29**, and by adjusting the upper rod **32** through manipulation of the bolts **38** of FIG. **7**, the proper cutting relationship with the rotary knives **12** may be quickly obtained, it being noted that the bolts **38** are taken up to a point to cause the recutter screen to fit closely against the arcuate abutment edges **27** of the crescents **26**.

It is obvious that in use of the improved mechanism the knives **12** only coact with offset cutting edges such as the edges **22** or **23**. The knives do not have to rub against the entire surface of the recutter screen as is conventional. Thus, cutting is performed with less expenditure of power and with greater efficiency. Furthermore, when one set of knives, such as the knives **23**, become dull, the screen may be readily reversed by merely removing the pin clips **39** from the upper rod **34** and **41**, from the lower rod **40**, and then withdrawing said rods. This then allows removal of the screen through the top and reversal thereof. It may be quickly installed in reverse position by reinserting the rods, and by performing required adjustments of the bolts **28** for the crescents and of the nuts **38** of FIG. **7**.

In order to install a recutter screen on an ensilage harvester, it was heretofore necessary to open the blower and install a new screen from the bottom. This was a tedious job. With the present invention such screens may be quickly installed without opening the blower.

The use of the improved recutter screen makes it possible to reduce roughage to finer material. Many farmers feed soft ear corn through cutters equipped with this type of recutter screen and then blow the material into a silo. It is also possible to reduce corn cobs through a recutter screen of the type of the present invention, and mix said cobs with a protein supplement to provide a nutritious feed at little expense. Dry ear corn may also be run through a recutter screen of this type to produce a mixture of cracked kernels and roughage that is exceptionally digestible. The present invention makes it possible to operate much more efficiently with a recutter screen and with less expenditure of power, and the reversibility feature, coupled with the ease of installation in reversed position, prolongs the life of the recutter screen.

Various changes and modifications may be made without departing from the spirit of the invention, and all of such changes are contemplated as may come within the scope of the claims, it being understood that, while it is preferred to provide a reversible screen, the idea of inwardly offsetting edges of the bars between holes of a screen has utility, even though only one of such edges, such as only the edges **23**, is bent.

I claim:

1. A recutter screen comprising a sheet of metal in arcuate form having rows of punched rectangular openings therein from which the metal has been completely removed, and which openings are separated by bars formed by the material of the sheet, some of which extend generally longitudinally of the screen, edges of the latter bars being bent in inwardly offset condition to provide shearing blades at the edges of openings.

2. In a grinder having a rotatable cylindrical cutter with knives, a recutter screen in arcuate form having rows of punched rectangular openings therein separated by bars formed by the material of the sheet, some of which extend generally longitudinally of the screen, said latter bars having opposite edges bent to provide oppositely positioned fixed shearing blades, said recutter screen being positioned concentrically of the axis of rotation of the cutter and in a position where the rotating knives coact in shearing relationship with inwardly offset edges of the bars, said screen being shaped so that it can be reversed in position when one set of fixed blades becomes worn to permit use of the opposite set of blades, and means for readily detachably connecting the screen in either of its alternative positions.

3. In a grinder having end walls and having a rotatable cylindrical cutter with knives, a recutter screen in arcuate form having openings therein, said recutter screen being positioned concentrically of the axis of rotation of the cutter and in a position where the rotating knives coact in shearing relationship therewith, the improvement comprising means for removably maintaining the screen in said position, said means comprising a curved abutment member adjustably connected to the inner side of each end wall of the grinder, each of which has an arcuate abutment edge concentric with the axis of rotation of the cylindrical cutter against which the inner face of an end of the screen is removably seated, elongated retainers secured to and projecting from the outer face of the screen adjacent the upper and lower edges thereof, each having a transversely extending shoulder, an elongated rod positioned against the outer face of the screen to form a seat for the shoulder of each retainer, there being openings in the end walls of the grinder through which the ends of the rods are received, the openings for one of said rods being slotted, and means on the end walls for adjusting the last mentioned rod in the slotted openings to draw the ends of the screen into abutment with the arcuate edges of the abutment members.