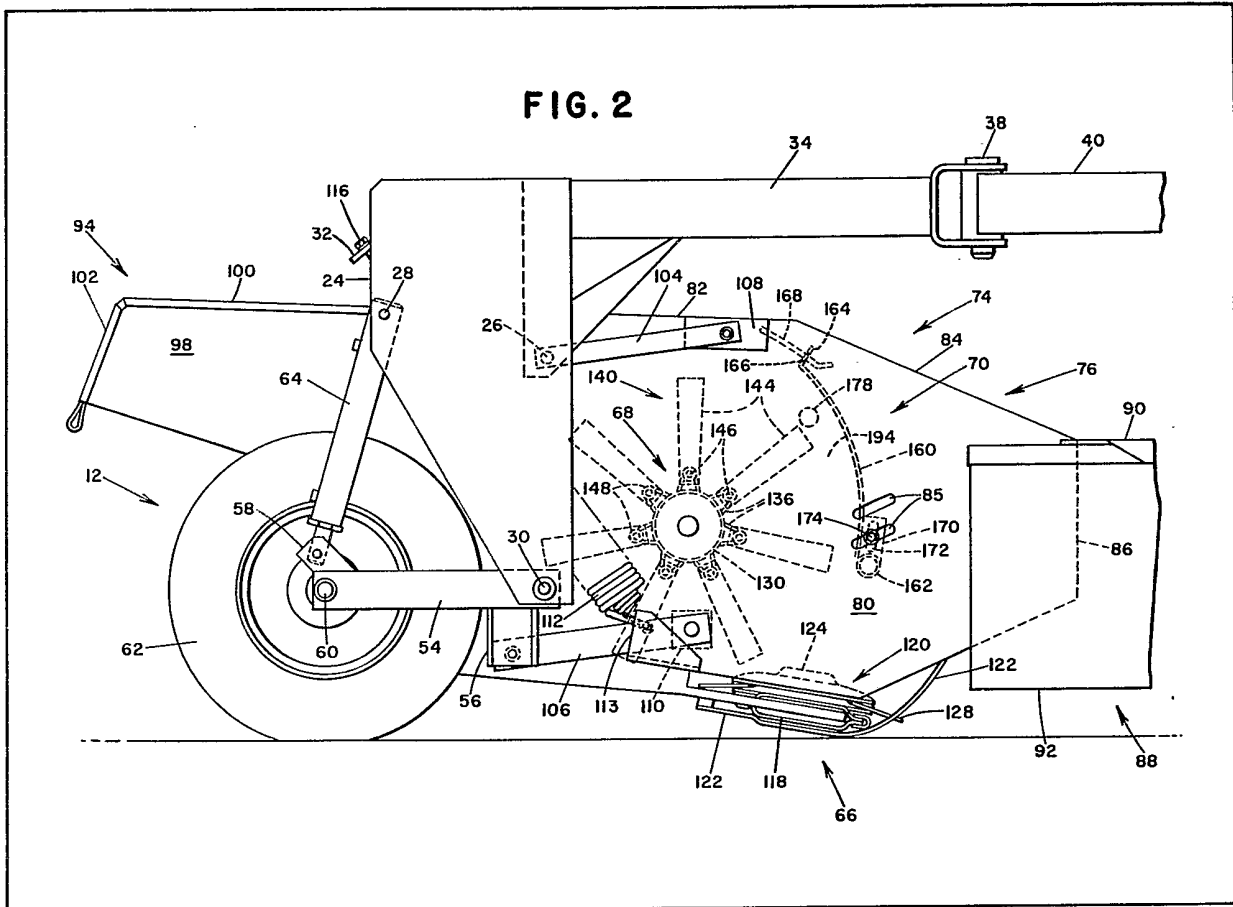


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(54) Mower conditioner

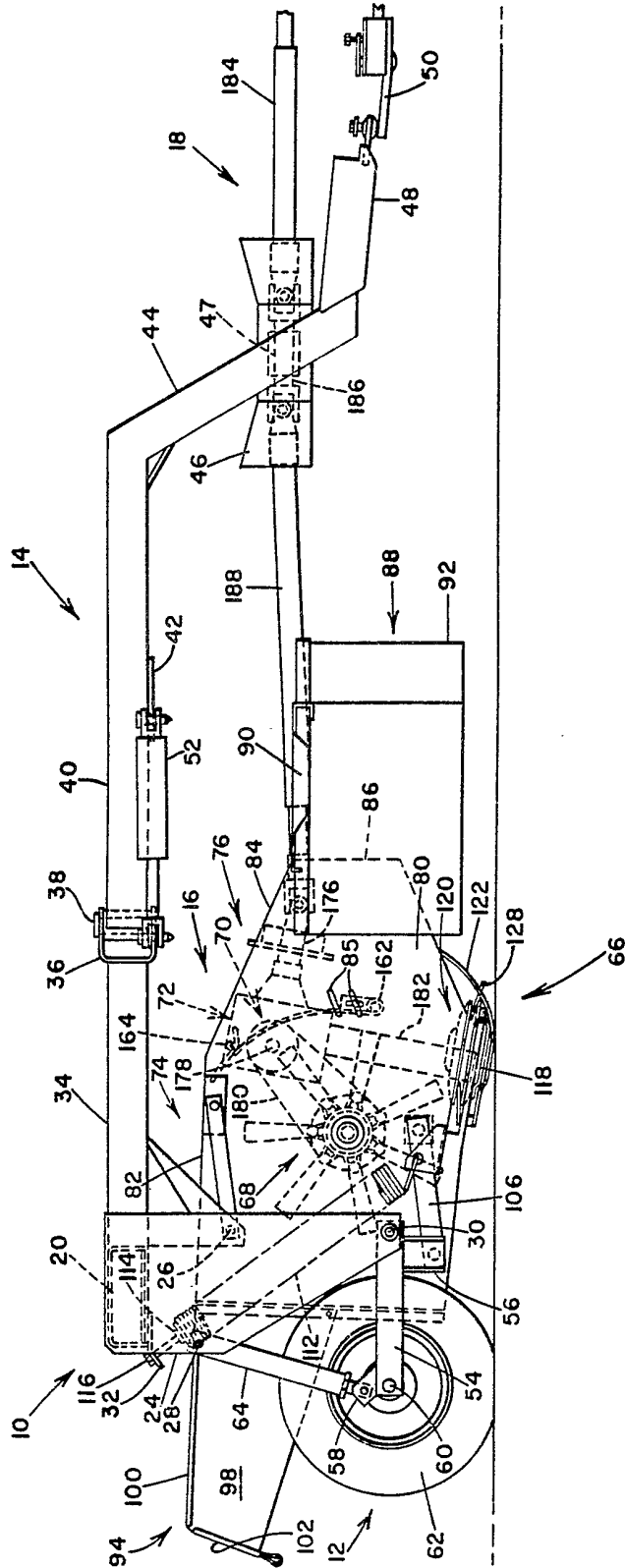
(57) A mower-conditioner (10) for grasses and legumes conventionally has a transverse cutter bar (66) above which is an impeller rotor (68) and a curved conditioning plate (160) disposed about a portion of the periphery of the rotor so crop is first cut by the bar and then conditioned during passage along the channel formed between the plate and rotor. In the invention, the plate (160) is of unitary construction and the whole plate is adjustable, after release of a single clamping bolt (174) on either side of the machine, by movement not only toward and away from the rotor but also round the rotor periphery. This adjustability allows the machine to accommodate various crop conditions and to achieve desired operating conditions.



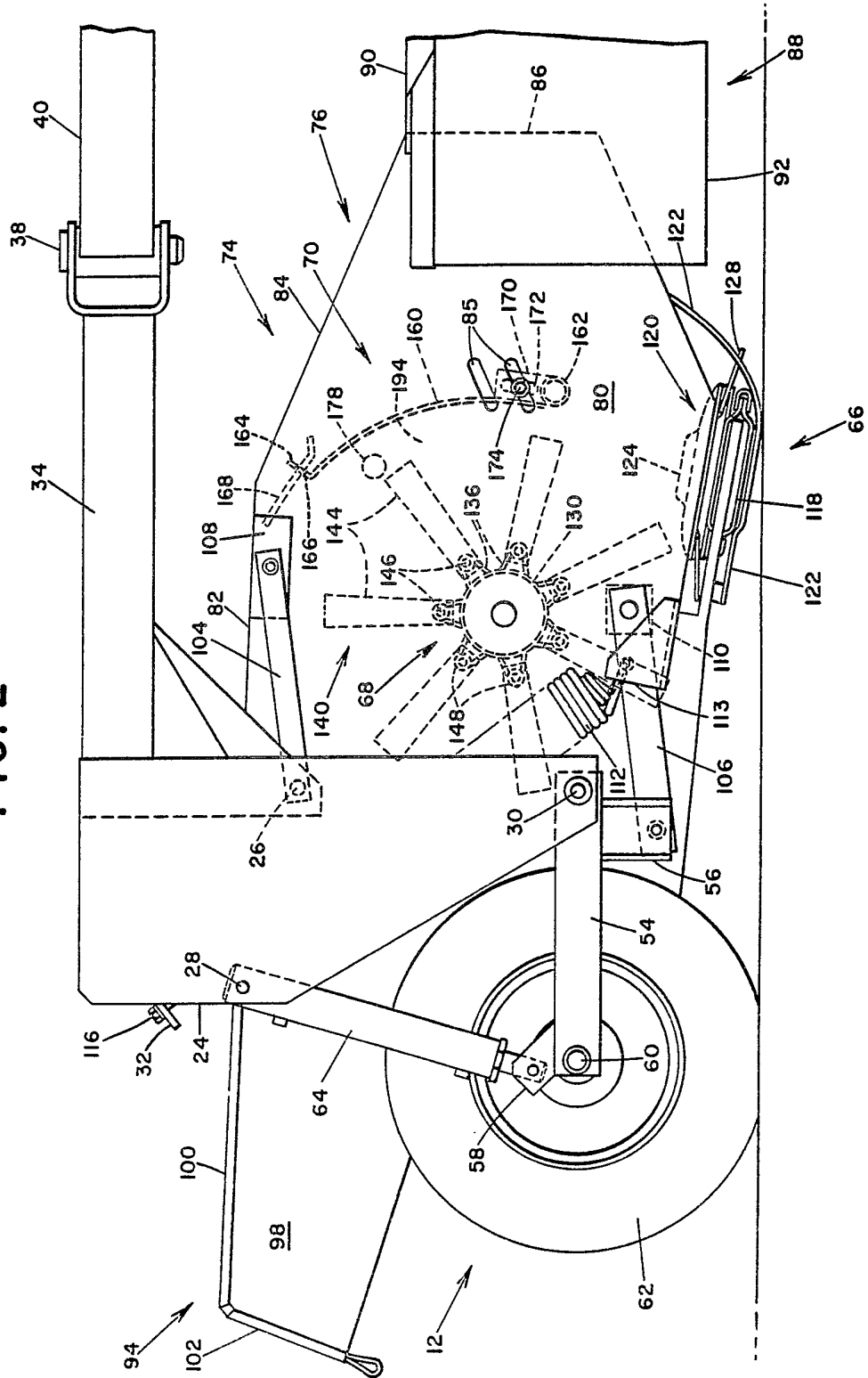
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FIG. 1



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**FIG. 2**



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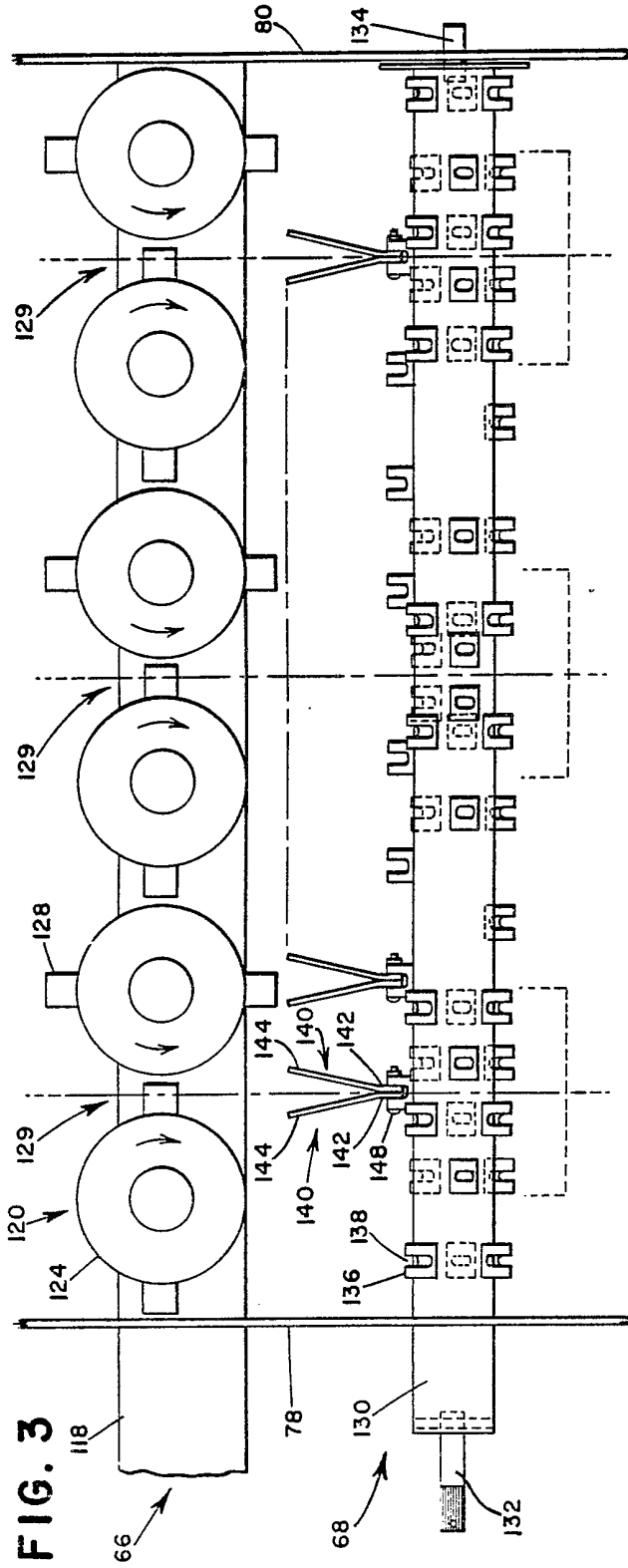


FIG. 3

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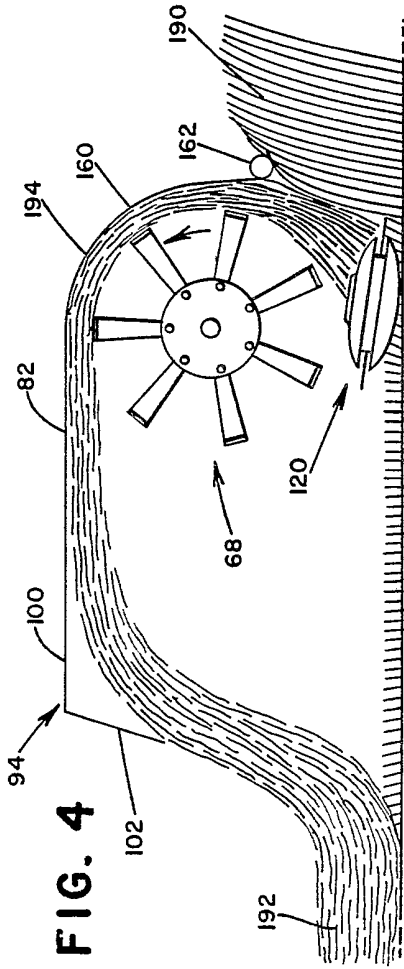
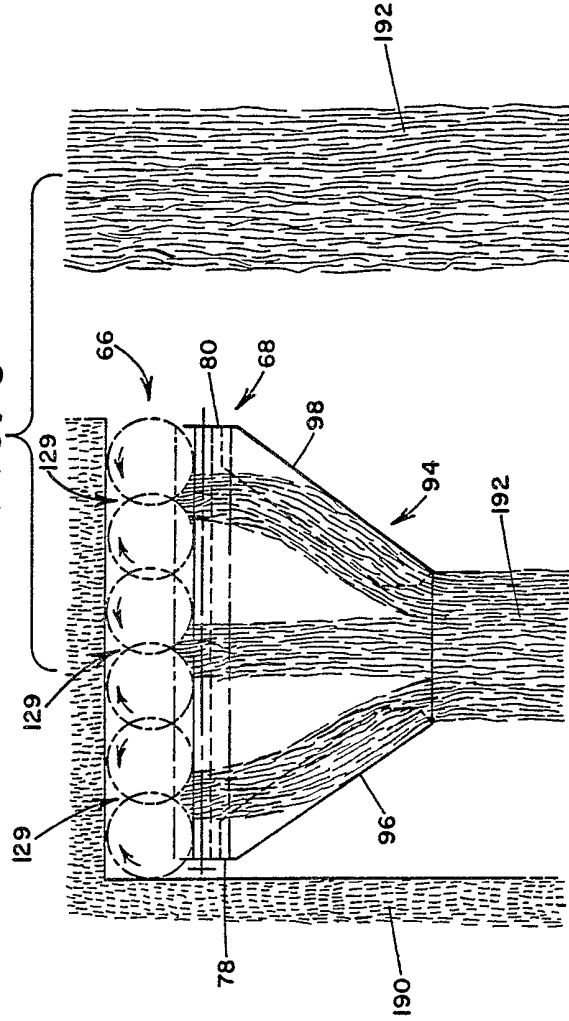
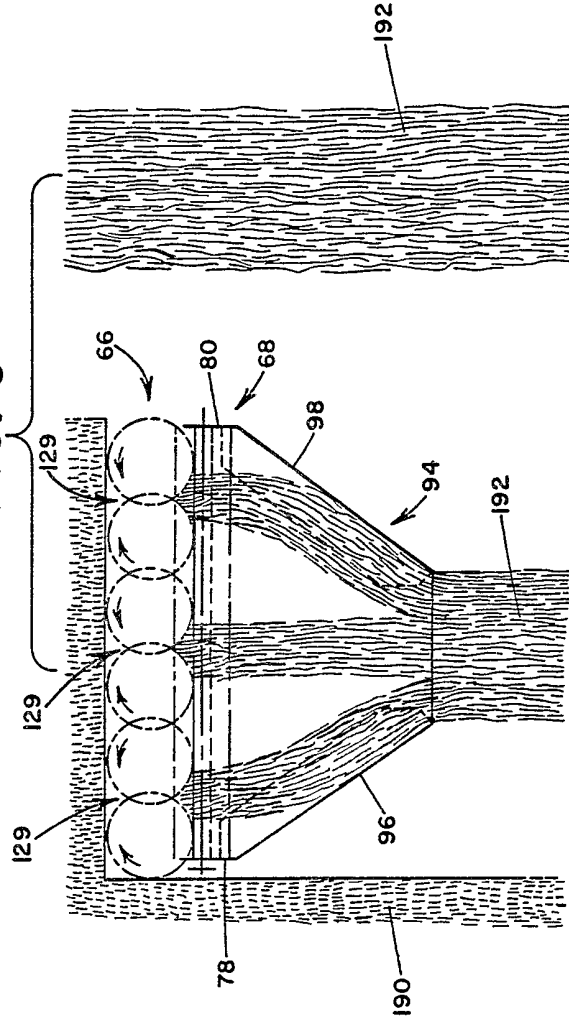


FIG. 4

FIG. 5



## SPECIFICATION

**Mower-conditioner**

5 This invention relates to a mower-conditioner for cutting and conditioning crop material such as grasses and legumes.

A conventional mower-conditioner has a generally transverse cutter bar which delivers cut material rearwardly to an adjacent impeller rotor parallel to the cutter bar for conditioning and discharge into a windrow. Typically, such machines are provided with a hood over the rotor, the forward part conforming fairly closely to the rotor periphery and creating a confined conveying channel or conditioning zone through which crop material is carried by the rotor before being discharged rearwardly into a crop deflecting and windrow forming portion of the hood. The configuration and disposition of the hood portion forming the conveying channel and conditioning zone have important effects on power consumption and material flow control as well as on the intensity of crop treatment or conditioning. Operating and crop conditions vary widely.

25 The present invention provides a mower-conditioner which can be adjusted for such conditions effectively and simply.

According to the present invention a mower-conditioner for crop material includes an impeller rotor for conditioning the crop material and a unitary curved guide plate extending round a portion of the periphery of the rotor to form a crop conveying channel therewith, the plate being mounted at its trailing and leading edge portions for pivotal and sliding movement and being releasably clamped at one said portion only so that, on unclamping, the plate can be adjusted round, and toward and away from, the said periphery.

Generally radial adjustment controls intensity of conditioning and/or size of entry into the conveying channel and conditioning zone, and adjustment of the leading or lower edge of the guide plate controls height of entry to the conveying channel.

Circumferential adjustment of the unitary guide plate and hence of its trailing edge provides some control of the direction of discharge of material from the conveying channel and thus of windrow conformation.

The adjustment is simple because it is only necessary to unclamp the plate at one edge portion to allow movement of the plate in two senses, i.e. round the rotor or toward and away from it. It is thus not necessary to support the guide plate at more than its leading and trailing edges.

55 An embodiment of the invention will now be described with reference to the accompanying diagrammatic drawings in which:

Figure 1 is a somewhat schematic right hand side elevation of an impeller mower-conditioner with its header assembly in operating position and showing an adjustable guide plate;

Figure 2 is an enlarged partial right side elevation particularly showing the header assembly with the guide plate of Figure 1;

65 Figure 3 is a schematic overhead view of the cutter bar and rotor assemblies with longitudinal spacing between cutter bar and rotor increased for clarity;

Figure 4 is a schematic longitudinal section illustrating the flow of crop material through the mower-conditioner; and

70 Figure 5 is a schematic top view illustrating the flow of crop material through the mower-conditioner.

In the drawings the impeller mower-conditioner includes a main frame indicated generally by the numeral 10, a pair of wheel assemblies 12 for supporting the machine above the ground, a forward extending tongue 14 for hitching to a towing vehicle such as an agricultural tractor, a header 16 carried by the main frame 10 and a drive line 18 for transmitting power from the towing vehicle to the header 16.

The main frame 10 includes a transverse main beam 20 (shown in end view only in the drawings) and opposite upright left and right hand depending portions or wheel drops 22 and 24, respectively, rigidly attached to the opposite ends of the beam 20. In each wheel drop portion 22 and 24 there are three transverse pivot points, front upper 26, rear upper 28 and lower 30.

90 A spring anchor bracket 32 extends rearwardly and downwardly adjacent the rearward side of each of the junctions between the upright members 22 and 24 at the opposite ends of the transverse beam 20 respectively. Extending forwardly from the left hand end of the transverse beam 20 is a tongue support member 34, a tubular frame member of rectangular cross section, closed at its forward end by a laterally extending clevis-like member 36.

The tongue 14 is pivotally connected to the clevis-like member 36 by a pin 38 and includes a generally horizontal rear portion 40 carrying a hydraulic cylinder bracket 42 attached to its lower side and extending towards the right. The tongue also includes a power line bearing portion 44 rigidly attached to the rear tongue 40 and extending forwardly and downwardly and including a power line bearing assembly 46 having an approximately horizontal fore-and-aft bearing bore 47. A forward tongue portion 48 extends forwardly from the lower end of the power line bearing portion 44 and is designed to be hitched to the drawbar or drawbar extension 50 of a towing vehicle in a conventional manner. A hydraulic cylinder 52 for controlling the horizontal angle between the tongue 14 and the main frame 10 is connected between the cylinder bracket 42 on the rear tongue 40 and a point on the clevis member 36 towards the right hand side of said member.

Each wheel assembly 12 includes a generally fore-and-aft extending wheel support arm 54 attached for pivoting in an approximately vertical plane by its forward end to the lower pivot point 30 of the main frame wheel drops 22 and 24, respec-

tively. Each wheel support arm 54 includes, just rearward of its forward pivot point, a downwardly extending lower float link pivot bracket 56 and, extending upwards adjacent its rearward end, a hydraulic cylinder bracket 58. A transversely extending wheel spindle 60 rigidly attached adjacent the rearward end of each wheel support arm 54 carries a wheel 62. A hydraulic cylinder 64 is pivotally connected at its ends between each rear upper pivot point 28 of the main frame legs 22 and 24, respectively, and each cylinder pivot bracket 58 and is actuated by a hydraulic power source on the tractor for raising and lowering the mower-conditioner between operating and transport positions.

The header assembly 16 (best seen in Figure 2) is floatingly supported under the arch formed by the transverse beam 20 and the depending wheel drops 22 and 24 of the main frame 10. It includes frame members (not shown in the drawings) supporting component assemblies including a cutter bar 66, a rotor 68, a conditioning plate assembly 70, a gearbox 72 and hood 74.

The hood 74 includes a forward portion 76 having opposite upright generally fore-and-aft extending, left and right hand side sheets 78 and 80, respectively, an approximately horizontal rearward top portion 82 and a contiguous forwardly and downwardly inclined forward top portion 84. Each side sheet, 78 and 80, includes a pair of parallel inclined slots 85. The open forward hood inlet 86 formed by the forward edges of the top portion 84 and the side sheets 78 and 80 is shielded by a safety shield assembly 88 which includes a generally rectangular top portion 90 extending the full width of the hood inlet opening 86 and, depending from the forward and opposite side edges of the top 90 and reaching close to the ground, a continuous canvass safety curtain 92.

The hood 74 also includes a rearward deflector portion 94 having generally upright, left and right hand side sheets 96 and 98, respectively, contiguous with the rear edges of the forward side sheets 78 and 80, respectively, and extending rearwardly and inwardly, an approximately horizontal top 100 extending between the upper edges of the side sheets 96 and 98 and an approximately upright transverse rear sheet 102 contiguous with the rearward edges of the side sheets 96 and 98 and the top 100.

The header assembly 16 is carried by opposite pairs of approximately parallel upper and lower float links 104 and 106, respectively. The float links are pivotally connected at their respective forward ends to opposite pairs of upper and lower support plates 108 and 110, respectively, carried forward of the wheel drops 22 and 24 by the opposite forward side sheets 78 and 80, close to their upper and lower edges, respectively. The rearward ends of the float links 104 and 106 are pivotally supported at the opposite header support pivot points 26 of the wheel drops 22 and 24 and the pivot brackets 56 of the opposite wheel support arms 54, respectively, the links 104 and 106 lying nearly horizontal when the header assembly 16 is in a working position.

The header assembly 16 is biased upwards by a pair of opposite float springs 112, each spring being

inclined rearwardly and upwardly and having a lower end hooked to one of a pair of opposite spring brackets 113 rigidly attached to the hood outside the forward side sheets 78 and 80 respectively, towards their lower edges. The upper end of each spring 112 carries a retaining nut 114 which is threadingly engaged by a spring tension adjusting bolt 116 passing through and anchored by one of the pair of spring anchor brackets 32 carried by the main frame 10.

The cutter bar assembly 66 is supported by the frame of the header assembly 16 and extends transversely between the opposite forward hood side sheets 78 and 80 close to the lower edges of the sheets and ahead of the lower float links 106. The cutter bar assembly 66 includes an elongated beam 118 in which are journaled a series of six equally spaced side-by-side disc cutter units 120 having axes of rotation perpendicular to the beam 118. The cutter bar assembly 66 is inclined so that the disc cutter units 120 reach forwardly and downwardly. A ground-engaging skid or shoe 122 carried at the left hand end of the cutter bar beam 118 as well as ground-engagement by the underside of the beam 118 limit the minimum cutting height of the cutter units 120.

Each cutter unit 120 includes an upper saucer-like disc or shield 124 and a pair of diametrically opposite free swinging knife sections 128 carried by the disc 124 pivoted below and extending radially beyond the periphery of the disc.

The spacing of the disc cutter units on the beam 118 is such that the paths of the knife sections 128 of adjacent cutter units 120 overlap. However, conventional gear drive means (not shown) housed in the cutter bar beam 118 are arranged so that the cutters are all driven at the same rotational speed and timed so that adjacent cutter units 120 are out of phase by approximately 90° so that there is no interference between the knife sections 128 of adjacent cutter units 120 as they rotate and so that adjacent cutter units 120 contra-rotate, the extreme left hand cutter unit 120 being driven clockwise as viewed from above, the adjacent cutter unit counterclockwise as viewed from above and so on across the cutter bar assembly as indicated in Figure 3. There is thus for each pair of cutter units 120 a bite or crop concentration zone 129 into which the cutter units 120 tend to gather, and deliver rearwardly, served crop material.

The rotor assembly 68 (best seen in Figure 3) transversely spans the header assembly 16 behind and above the cutter bar assembly 66. It includes an elongated central tube or core 130, the right hand end of which is adjacent the inside surface of the forward right hand hood side sheet 80 and the left hand end of which extends a short distance through the forward left hand side sheet 78. Co-axial left and right hand shafts 132 and 134 extend from the opposite ends of the tube 130 and are journaled in bearings (not shown) carried by the header frame (not shown). A plurality of flail brackets 136 is spaced axially and circumferentially over the surface of the rotor tube 130, each bracket 136 being formed from a length of flat steel bar having a central elongated slot 138, the bar being bent into a V form and attached

rigidly to the tube so that as viewed from the end of the rotor each bracket appears as a V form with its top butted against the surface of the tube 130. The central slot 138 of each flail bracket 136 becomes in effect a circumferentially disposed notch.

The rotor also includes a plurality of free swinging flails or conditioning elements 140 arranged in back-to-back pairs, each pair carried by a separate flail bracket 136. Each flail 140 is formed from a tapered flat bar having a narrow lighter end or pivot portion 142 and a wider and heavier opposite outer portion 144 (Figure 3). To place the centre of mass of the conditioning elements relatively towards the periphery of the rotor, the simple outwardly tapering form has been used for the flail 140. Clearly any of a large number of alternative means could be used to achieve or enhance this concentration of mass. Each flail 140 has a mounting or pivot hole 146 close to the end of the pivot portion 142 and is bent slightly along a transverse line somewhat beyond the pivot hole 146. In assembly, the flails 140 are arranged in pairs back-to-back with the holes 146 in the pivot portions 142 aligned. The pivot portions 142 are inserted into the bracket slots 138 so that a flail retaining pin 148 may be inserted, parallel to the rotor axis, so as to retain the flails 140 but permit them to swing or pivot about an axis parallel to the axis of the rotor. Clearances in the flail pivot holes 146 and in the bracket slots 138 also permit limited sideways (axial) deflection of the flails. After assembly and as viewed circumferentially, each pair of flails 140 appears as a narrow V with its open end disposed radially outwards.

The flail brackets 136 are arranged in seven rows, the rows equally spaced circumferentially around the core tube 130, each row parallel to the axis of the rotor. The disposition of the flails 140 is described in detail in the specification of our co-pending application 7843058 and a mower-conditioner having flails with such a disposition is claimed therein.

The conditioning plate assembly 70 includes a conditioning plate 160 extending the full width of the header assembly 16 inside the hood forward side sheets 78 and 80. The conditioning plate 160 is of arcuate cross section supported to be approximately concentric with the rotor assembly 68. It extends circumferentially over about 75° of arc, i.e. approximately over a quadrant of the rotor periphery, and has a lower or leading edge lying slightly below the rotor centre, i.e. the leading edge is in the vicinity of the horizontal plane of the rotor axis. A tubular push bar 162 is rigidly attached to and reinforces the lower edge of the conditioning plate 160. The upper or trailing transverse edge of the conditioning plate, which as can be seen from Figure 2 is disposed at a level above that of the rotor, is bent upwards to form a stiffening flange 164. For positioning and supporting the upper portion of the conditioning plate 160, notches 166 in each end of the flange 164 slidably engage a pair of opposite fixed guide flanges 168, approximately concentric with the rotor 68 and carried by frame members of the header assembly 16 adjacent the inside walls of the forward hood side sheets 78 and 80. The push bar portion 162 of the conditioning plate assembly 70 includes at its oppo-

site ends a pair of mounting brackets 170, each bracket having a vertical slot 172. A clamping bolt 174 on each side of the machine passes through the slot 172 and through one of the pair of inclined slots 85 in the opposite hood side sheets 78 and 80 so that the push bar 162 and leading edge of the conditioning plate 160 may be adjusted in relation to the rotor 68, the notches 166 at the trailing edge of the conditioning plate sliding to assume a new position on the guide flanges 168 as required.

The gearbox 72 includes a forward extending input shaft portion 176 and two output shafts, a laterally extending rotor drive shaft 178 driving the rotor 68 through a conventional V belt drive 180 and a downward extending cutter bar drive shaft portion 182 driving the cutter bar assembly 66 through a conventional gear drive (not shown).

The drive line assembly 18 is conventional and transmits power from the power take-off shaft of a towing vehicle through a forward telescoping drive shaft assembly 184, an intermediate or transfer shaft 186 journaled in the bore 47 of the power line bearing assembly 46 housed in the power line bearing portion 44 of the tongue, and a rear telescoping drive shaft assembly 188 connected to the input shaft 176 of the gearbox 72.

In operation, the impeller mower-conditioner is advanced in a field of standing crop powered by a towing vehicle, such as an agricultural tractor, so that the disc cutting units 120 sever crop material. The effect of contra-rotation of adjacent disc cutter units 120 is that they act in pairs, as indicated in Figure 5, each pair gathering and converging crop material across the front of the cutter bar 66 into the bite or crop concentration zone 129 between the discs, the severed material tending to be concentrated in a rearwardly directed stream.

As indicated in Figure 4, the rearwardly directed crop material is intercepted by the flails 140 of the rotor 68 and carried at first generally upwards and then up and over the rotor 68 through a conditioning zone 194 defined by the juxtaposition of the conditioning plate 160 and the rotor to be discharged generally rearwardly and horizontally within the deflector hood 94. The arrangement of rotor and cutting means of the present embodiment in which the cut material is intercepted and carried up and over the rotor for rearward delivery is called an overshoot rotor configuration. In Figure 5, the concentration of the conditioned material delivered rearwardly from the conditioning zone 194 has been emphasized for clarity and, as indicated, the three parallel streams of material are converged inwards and downwards into a windrow 192 by the deflecting action of the left hand and right hand rear side sheets 96 and 98 and the rear hood sheet 102.

The partial wrapping or shrouding of the rotor 68 by the forward portion 76 of the hood and more particularly by the conditioning plate 160 contains crop material in a controlled relationship with the flails 140 in the conditioning zone 194. The process of conditioning the crop material, begun when the material is first intercepted by the flails at the cutter bar, is completed while the material is being accelerated for rearward discharge into the windrow 192.



## CLAIMS

1. A mower-conditioner for crop material including an impeller rotor for conditioning the crop material and a unitary curved guide plate extending round  
5 a portion of the periphery of the rotor to form a crop conveying channel therewith, the plate being mounted at its trailing and leading edge portions for pivotal and sliding movement and being releasably clamped at one said portion only so that, on  
10 unclamping, the plate can be adjusted round, and toward and away from, the said periphery.
2. A mower-conditioner according to claim 1 in which the plate is guided and releasably clamped at its leading edge portion, and guided and free to  
15 move at its trailing edge portion.
3. A mower-conditioner according to claim 2 in which the guide for the trailing edge portion is approximately concentric with the rotor axis.
4. A mower-conditioner according to claim 2 or 3  
20 in which the mounting at the leading edge is by a clamp and a pair of intersecting slots, the clamp being relatively movable in the slots and one slot being disposed for guiding movement round the periphery and the other slot for guiding movement  
25 toward and away from the periphery.
5. A mower-conditioner according to any preceding claim in which the plate extends around approximately a quadrant of the rotor periphery.
6. A mower-conditioner according to any preceding  
30 claim in which the trailing edge of the plate is disposed at a level above that of the rotor.
7. A mower-conditioner according to any preceding claim in which the rotor is rotatable about a horizontal axis and the leading edge of the plate is in the  
35 vicinity of the horizontal plane of the axis at the limits of adjustment.
8. A mower-conditioner substantially as described herein with reference to, and as illustrated in, the accompanying diagrammatic drawings.