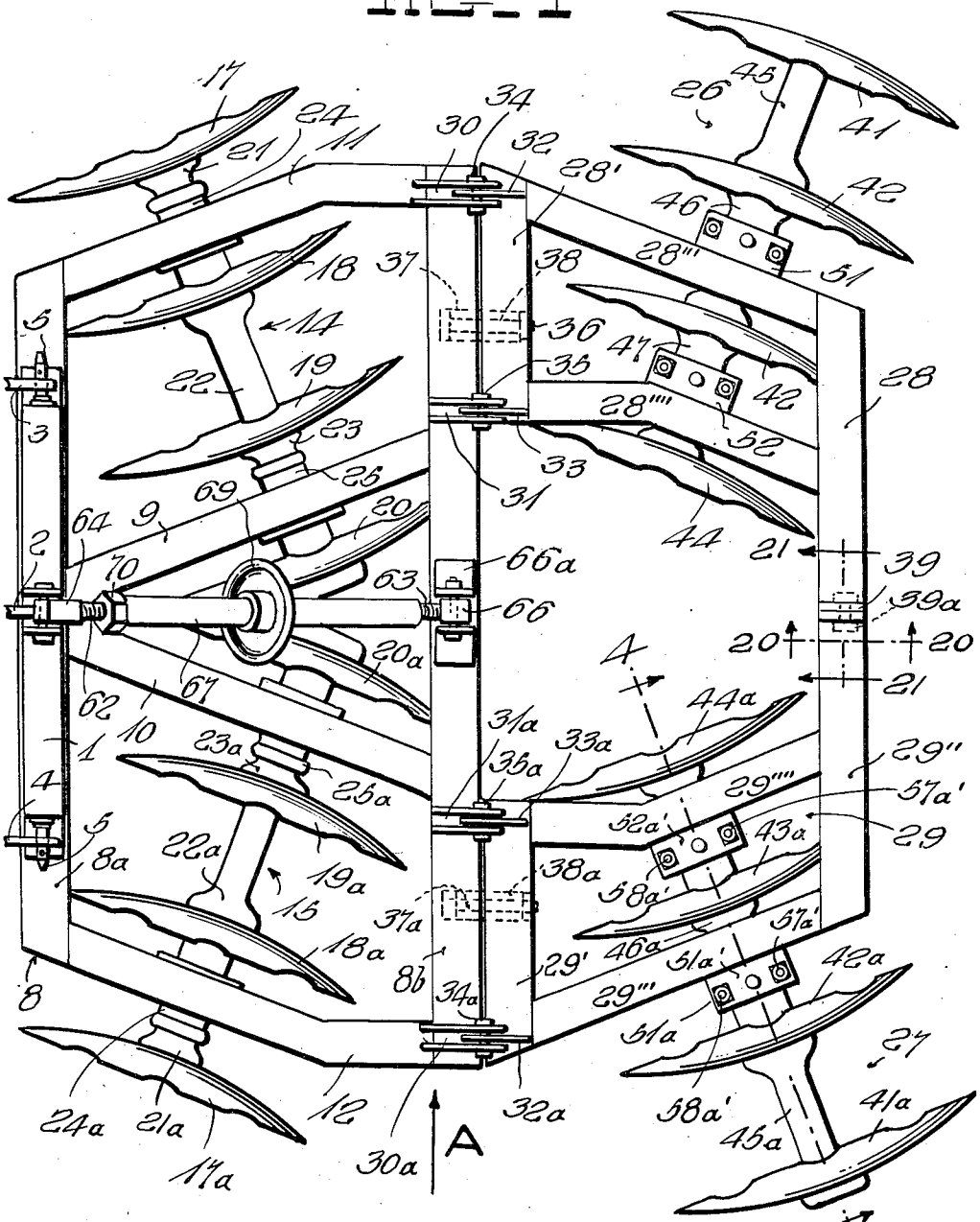
June 2, 1953 J. P. ROBERTSON 2,640,307

MULTIPLE LIFT TYPE DISK HARROW

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FIG. 1



June 2, 1953 J. P. ROBERTSON 2,640,307

MULTIPLE LIFT TYPE DISK HARROW

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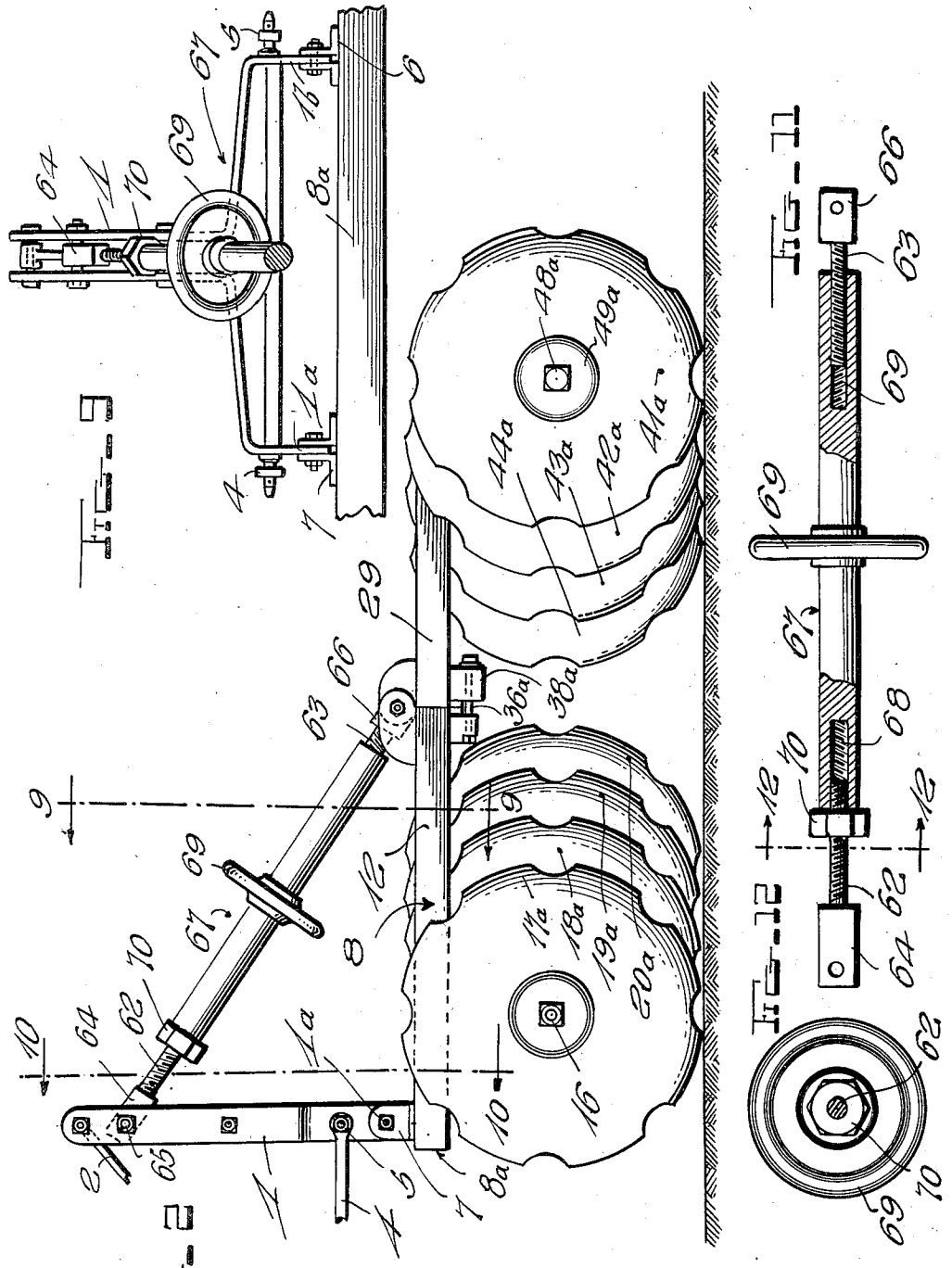


FIG. 5

FIG. 11

FIG. 12

FIG. 2

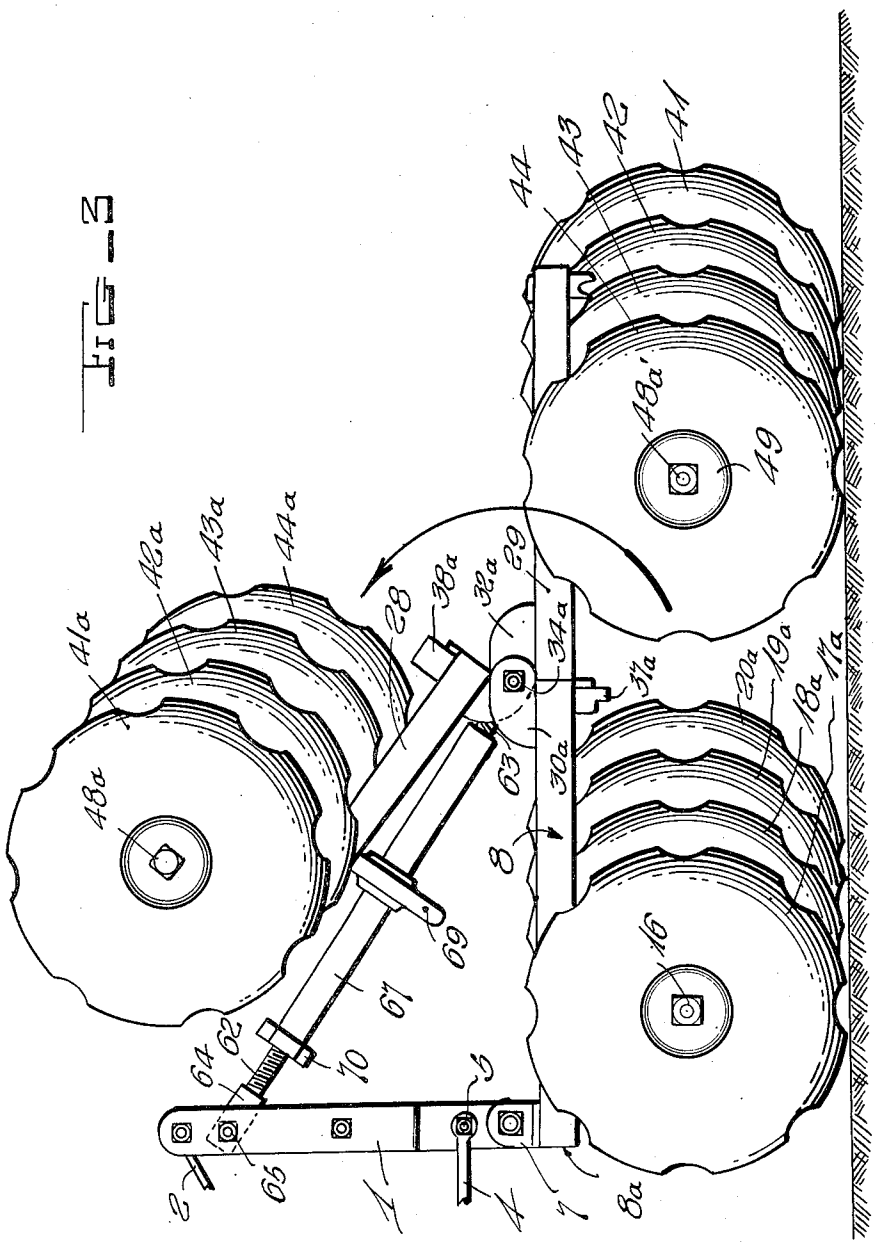
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June 2, 1953 J. P. ROBERTSON 2,640,307

MULTIPLE LIFT TYPE DISK HARROW

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FIG. 3



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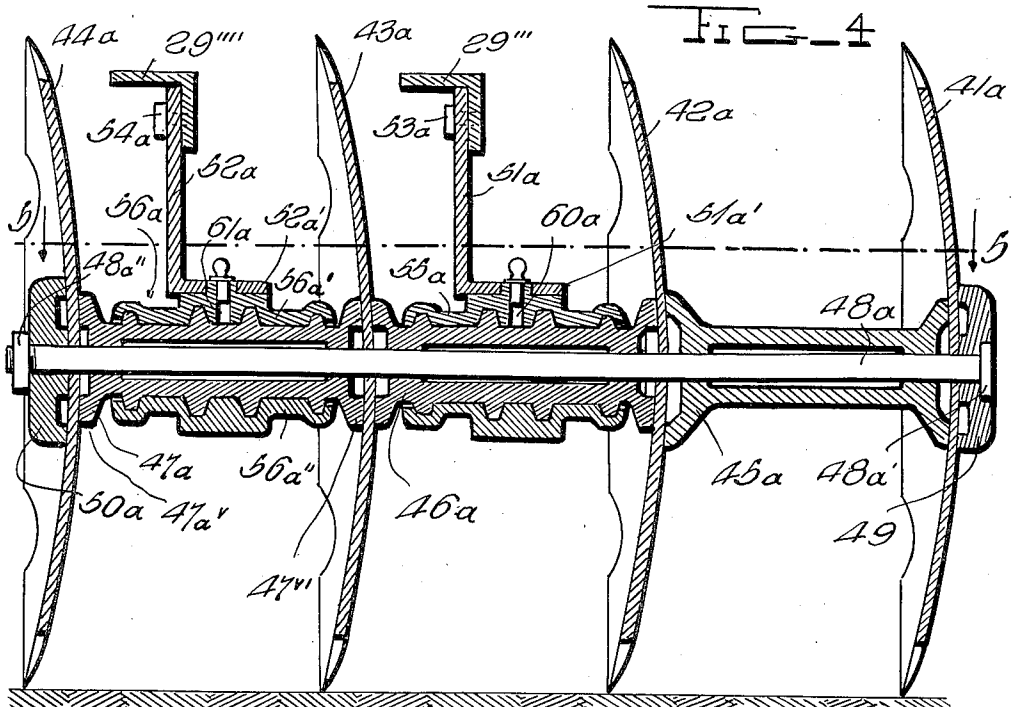
ATTORNEY

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MULTIPLE LIFT TYPE DISK HARROW

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FIG. 4



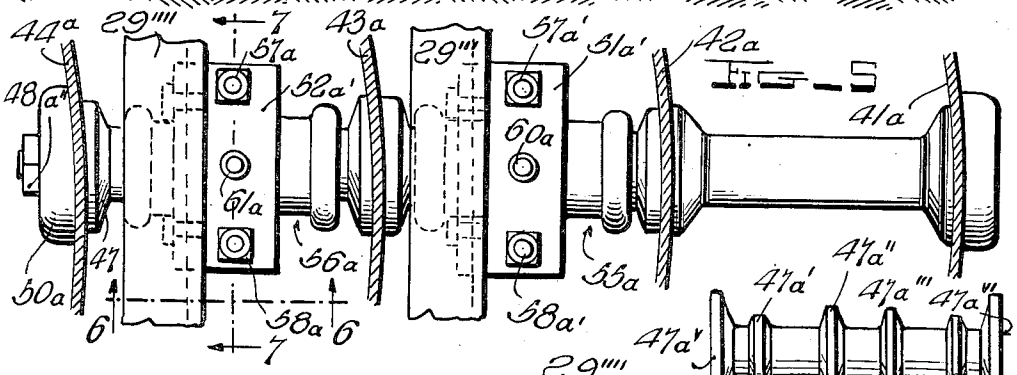


FIG. 5

FIG. 8

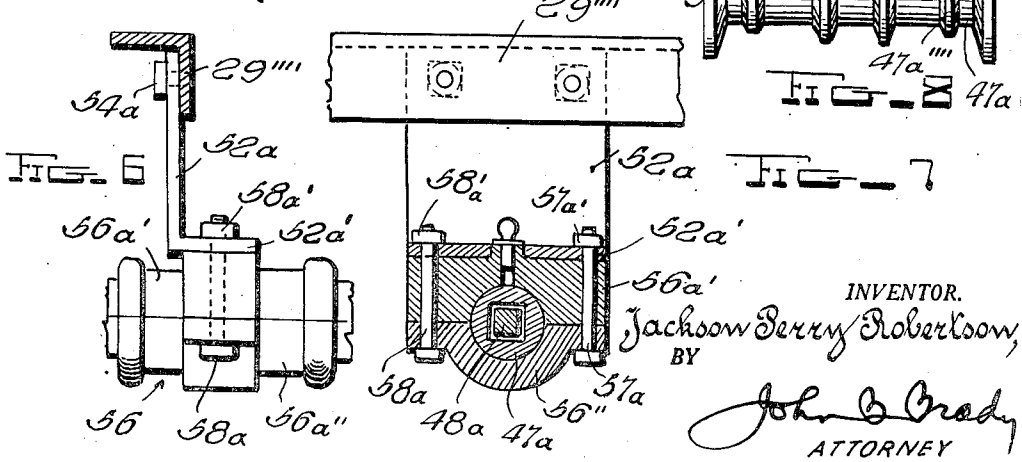


FIG. 6

FIG. 7

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June 2, 1953 J. P. ROBERTSON 2,640,307

MULTIPLE LIFT TYPE DISK HARROW

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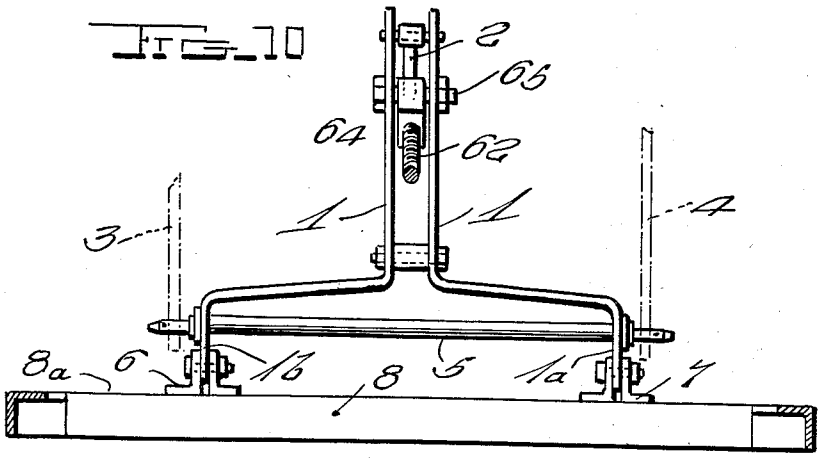


FIG. 10

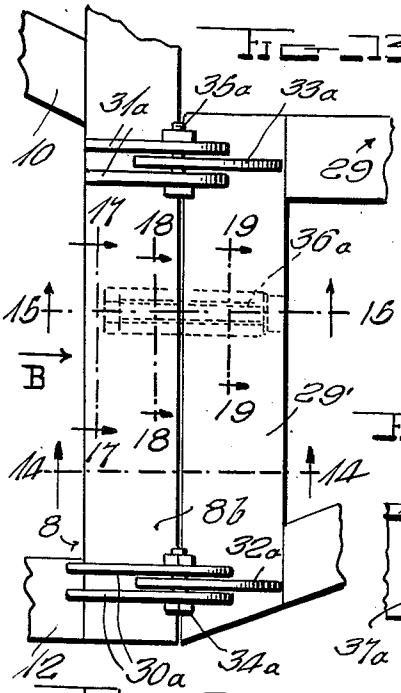


FIG. 13

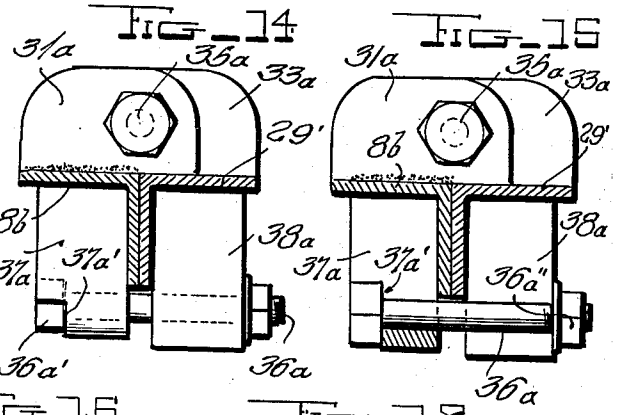


FIG. 14

FIG. 15

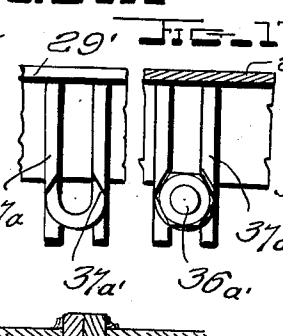


FIG. 16

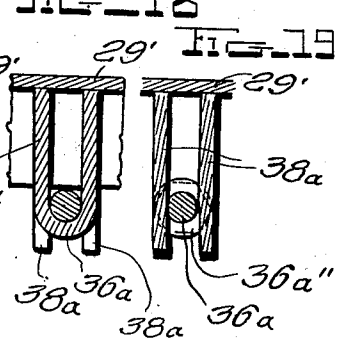


FIG. 17

FIG. 18

FIG. 19

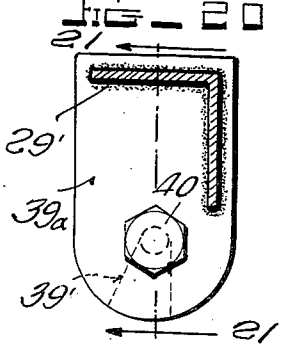


FIG. 20

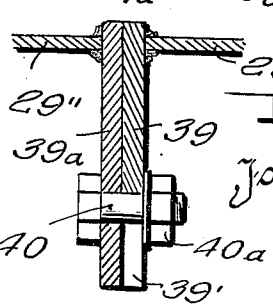


FIG. 21

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June 2, 1953 J. P. ROBERTSON 2,640,307

MULTIPLE LIFT TYPE DISK HARROW

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FIG. 22

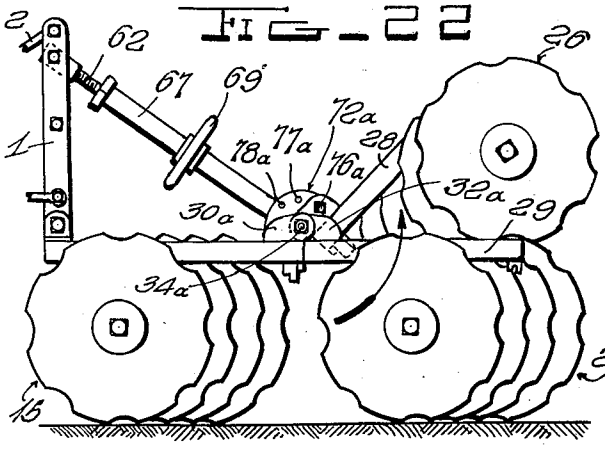


FIG. 24

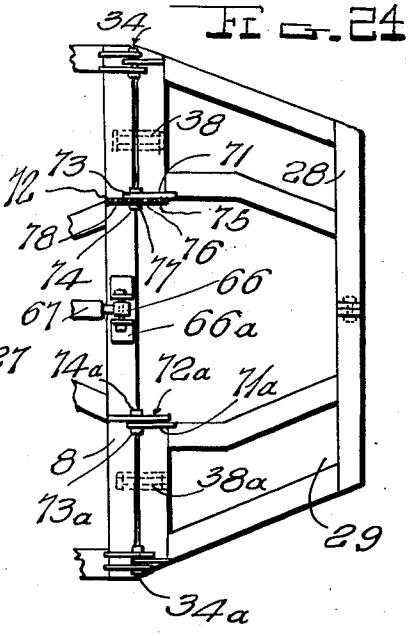


FIG. 23

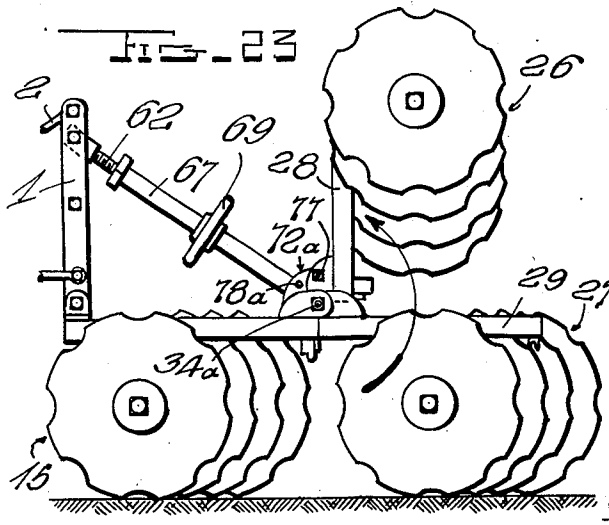
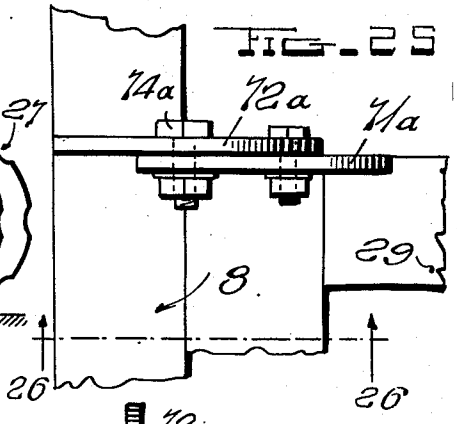


FIG. 25



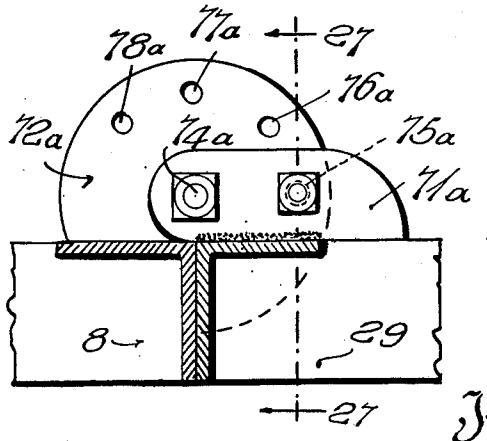


FIG. 26

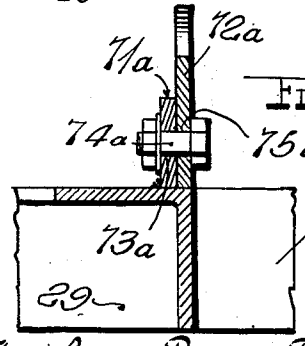


FIG. 27

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Patented June 2, 1953

2,640,307

UNITED STATES PATENT OFFICE

2,640,307

MULTIPLE LIFT TYPE DISK HARROW

Jackson Perry Robertson, Columbus, Miss.

Application May 18, 1950, Serial No. 162,764

7 Claims. (Cl. 55—30)

1

My invention relates broadly to agriculture equipment and more particularly to a lift type multi-disc harrow.

This application is a continuation-in-part of my application Serial No. 35,805 filed June 29, 1948 for Multiple Lift Type Disc Harrow.

One of the objects of my invention is to provide an improved construction of multiple disc harrow including means for conveniently and rapidly converting a single unit harrow to a multiple unit harrow and vice versa and maintaining the harrow in such converted condition throughout a desired operation.

Another object of my invention is to provide a construction of multiple unit harrow in which a screw-type strut is provided for maintaining a multiple unit harrow in ganged position while being readily adjustable to a position permitting the elevation of certain of the gangs for operating the harrow as a single unit implement.

Still another object of my invention is to provide an improved construction of pivot means for interconnecting the unit of a multiple unit harrow for insuring rigidity of the chassis structure of the implement during ganged operation thereof.

Still another object of my invention is to provide an improved construction of mounting means for the disc gangs of a multiple disc harrow for facilitating replacement and repairs to the equipment.

Still another object of my invention is to provide an improved construction of hinged connection between the frame sections of a multiple gang harrow for facilitating orientation of one frame section with respect to an adjacent frame section when converting from multiple unit operation to single unit operation and vice versa.

Still another object of my invention is to provide a construction of journalling means for the units of a multiple gang harrow for facilitating rotation of the harrow discs during propulsion of the harrow.

A still further object of my invention is to provide adjustable means for a multiple disc harrow for controlling the depth of penetration of the earth by the harrow discs, the adjustable means being accurate and precise for controlling the depth of penetration of the earth by the discs with corresponding accuracy.

Still another object of my invention is to provide an improved construction of locking means for maintaining the multiple units of the harrow in linearly aligned relation during harrowing operations.

Other and further objects of my invention reside in the improved features of construction of the multiple gang harrow set forth in the specification hereinafter following by reference to the accompanying drawings in which:

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Figure 1 is a plan view of the improved multiple unit harrow of my invention; Fig. 2 is a side elevational view of the multiple unit harrow of my invention looking in the direction of arrow A in Fig. 1; Fig. 3 is a view similar to the view shown in Fig. 2 with one of the units of the multiple unit harrow raised to elevated position; Fig. 4 is an enlarged transverse sectional view taken substantially on line 4—4 of Fig. 1 showing the arrangement of the harrow discs in one of the harrow units; Fig. 5 is a horizontal sectional view taken substantially on line 5—5 of Fig. 4; Fig. 6 is a fragmentary transverse sectional view taken substantially on line 6—6 of Fig. 5; Fig. 7 is a fragmentary vertical sectional view taken substantially on line 7—7 of Fig. 5; Fig. 8 is an elevational view of one of the bearing members employed for the suspension of the harrow gangs in the structure of my invention; Fig. 9 is a transverse sectional view taken substantially on line 9—9 of Fig. 2 showing the adjustable means for elevating and lowering the harrow units for controlling the depth of penetration of the harrow discs; Fig. 10 is a vertical sectional view taken substantially on line 10—10 of Fig. 2; Fig. 11 is an elevational view partially in section of the adjusting means employed in the multiple unit harrow structure of my invention; Fig. 12 is a transverse sectional view taken substantially on line 12—12 of Fig. 11; Fig. 13 is a fragmentary plane view on an enlarged scale of the hinge structure provided by the multiple units of the harrow of my invention; Fig. 14 is a transverse sectional view taken substantially on line 14—14 of Fig. 13; Fig. 15 is a transverse sectional view taken substantially on line 15—15 of Fig. 13; Fig. 16 is a fragmentary front elevational view looking in the direction of arrow B in Fig. 13 and showing the locking means for the harrow sections before insertion of the securing bolt; Fig. 17 is a view similar to the view shown in Fig. 16 but illustrating the locking bolt in position, the view being taken substantially on line 17—17 of Fig. 13; Fig. 18 is a transverse sectional view taken substantially on line 18—18 of Fig. 13; Fig. 19 is a transverse sectional view taken substantially on line 19—19 of Fig. 13; Fig. 20 is a transverse sectional view taken substantially on line 20—20 of Fig. 1; Fig. 21 is a vertical sectional view taken substantially on line 21—21 of Fig. 20 and Fig. 1; Fig. 22 is a side elevational view of a modified form of my invention by which the rear harrow units may be selectively maintained in predetermined angular positions with respect to the forward harrow units, the view illustrating the remote rear harrow unit raised at substantially 45° with respect to the plane of the axes of the forward harrow units; Fig. 23 is a view similar to the view shown in Fig. 22 but showing the remote rear harrow unit

raised and maintained in a 90° position with respect to the plane of the axes of the forward harrow units; Fig. 24 is a fragmentary plan view of the front and rear frame structures utilized in the form of my invention shown in Figs. 22–23 and showing the special construction of hinge members which I provide for selectively maintaining the rear harrow units in selected angular relation to the forward harrow units; Fig. 25 is an enlarged fragmentary plan view showing the structure of one of the hinges employed in the structure of Figs. 22–24; Fig. 26 is a vertical sectional view taken on the line 26—26 of Fig. 25; and Fig. 27 is a vertical sectional view taken on line 27—27 of Fig. 26.

My invention is directed to the type of multiple unit harrow described in my co-pending application No. 35,395 supra of which this application is a continuation-in-part and wherein I provide means for adjusting the depth of penetration of the earth by the harrow discs. I provide a leading and trailing or front and rear harrow unit where the leading harrow unit is pivotally connected to a frame which couples to the hitch connected to the tractor. The trailer harrow unit is pivotally connected with the leading harrow unit through special hinge means and may be locked in coplanar relation by an arrangement of special bolt fittings in accordance with my invention. The entire harrow structure may be elevated or lowered by special screw means manually adjustable to precisely and accurately regulate the depth of penetration of the earth's surface by the harrow discs. When the multiple unit harrow structure is to be operated in single gang arrangement instead of multiple gang arrangement the locking bolts are removed and the trailing unit is moved to a position superimposed over the leading harrow unit. The mass of the trailing harrow unit then becomes effective as ballast in aiding in the penetration of the earth by the discs of the leading harrow unit.

I provide special bearing and mounting means for the gangs of discs to facilitate rotation of the discs as the harrow is propelled by the pulling tractor. Completely replaceable gang units are provided in accordance with my invention for facilitating replacement and repair of the harrow.

Referring to the drawings in more detail, reference character 1 designates a hitch frame extending in a vertical direction and providing means for connection to a tractor through the lift arms designated at 2, 3 and 4 extended forwardly to the tractor. The lift arms 2, 3 and 4 pivotally connect with the hitch frame 1 so that the hitch frame 1 may be raised or lowered by the operation of the hydraulic lift mechanism on the tractor. The hitch frame 1 is provided with yoke-shaped arms through opposite portions of which the rod member 5 extends and which forms the connecting means for the lift arms 3 and 4 extending to the tractor. The ends of the hitch frame 1 extend beyond the rod 5 to positions 1*a* and 1*b* where they connect with the upwardly extending sets of lugs shown at 6 and 7 which are carried by the angle frame member 8*a* of the forward substantially horizontally extending frame member 8. The substantially horizontally extending frame member 8 provides mounting means for sets of harrow discs which are illustrated more particularly in Fig. 4. The substantially horizontally extending frame member 8 is substantially in the shape of a trapezoid and is laterally braced to provide a rigid frame by the angularly disposed angle frame members 9 and 10. These angularly disposed angle frame members 9 and 10 serve in coaction with the side frame angle members 11 and 12 as a support for the sets of harrow discs shown more particularly in Fig. 4.

The sets of harrow discs are arranged to revolve as the harrow is drawn forwardly over the field to be cultivated. The sets of harrow discs are represented mounted in their operative positions beneath the substantially horizontally extending frame 8 at 14 and 15 and consist of assemblies bolted together by bolt members 16, one of the ends of which is indicated in Figs. 2 and 3. The disc assemblies 14 and 15 are symmetrical in arrangement and are indicated as consisting of harrow discs 17, 18, 19 and 20 assembled together in spaced relation by sleeve-like spacer means indicated at 21, 22 and 23 constituting the assembly 14. A reserve arrangement of disc and spacer members constitute the assembly in harrow unit 15 consisting of spaced discs 17*a*, 18*a*, 19*a* and 20*a*, spaced by spacer members 21*a*, 22*a* and 23*a* corresponding to discs 17, 18, 19 and 20 and spacer members 21, 22 and 23 of the harrow disc assembly 14. The axes of the harrow disc assemblies 14 and 15 extend at an obtuse angle with respect to each other and with respect to the front of the frame member 8. The harrow discs are scalloped at their peripheral edges for pulverizing the earth. The spacer members 21 and 23 of harrow disc assembly 14 are journalled in bearings 24 and 25 depending from the horizontally extending frame member 8 while sleeve members 21*a* and 23*a* are journalled in bearings 24*a* and 25*a* depending from the horizontally extending frame member 8. Inasmuch as the detailed construction of the bearings and the detailed assembly of the harrow disc units 14 and 15 are similar to the structure and mounting of the rearwardly disposed harrow units, reference is made to the description hereinafter following of the rearwardly disposed harrow units 26 and 27 for a more complete understanding of both the mounting and assembly of the harrow units.

I arrange in a position coplanar with the horizontally extending frame member 8 a pair of frame members 28 and 29 disposed rearwardly of the frame member 8. The frame members 28 and 29 are individually hinged to the frame member 8 by means of very special constructions of hinges which are illustrated more clearly in Figs. 13, 14 and 15. Referring to Fig. 13 it will be observed that the rearwardly extending angle frame 8*b* of frame member 8 provides a support for pairs of upwardly extending plate members 30*a* and 31*a* which are welded to the top of angle member 8*b* in spaced positions thereon and extend beyond the rear edge of angle member 8*b*. The rear frame 29 which is coplanar with the forwardly arranged frame member 8 is provided on its leading edge frame 29′ with a pair of vertically extending spaced plate members 32*a* and 33*a* which extend between the spaced plate members 30*a* and 31*a* and are pivotally connected thereto by bolt members 34*a* and 35*a* enabling frame member 29 to be raised from a substantially coplanar position with frame member 8 as represented in Figs. 1 and 2 to a position superimposed over the harrow disc assemblies carried by frame member 8. When the rear frame member 29 is positioned coplanar with the forwardly frame member 8, the angle frames 8*b* and 29′

abut each other as shown more clearly in Figs. 14 and 15. The frame members 29 and 8 are maintained in the said coplanar relation by means of a locking bolt 36a which extends through a pair of depending lugs represented at 37a and 38a. The lug 37a is shown more particularly in Figs. 16, 17 and 18 as having a substantially U-shaped section which is recessed at the forward portion thereof as represented at 37a' to allow the entry of the hexagonally shaped head end 36a' of bolt 36a. The lug 38a is formed by a pair of depending plates between which the bolt 36a extends and is secured by washer and nut combination 36a''. Thus the bolt 36a is carried in the lug 37a and substantially maintained against dislodgement and passes beneath the angle frames 8b and 29' and between lugs 37a and 38a for maintaining frame member 29 in coplanar relation to frame member 8. The rear frame member 29'' of frame member 29 extends toward the center of the implement and terminates in a depending plate 39a shown more particularly in Figs. 20 and 21. The depending plate 39a carries a bolt member 40 therein which is directed transversely through a coacting plate 39 slotted at 39' to permit the entry of bolt 40, the plate 39 being carried by the extension 28'' of the frame member 28 having complementary parts to the parts of frame member 29 heretofore explained. Thus when frame members 29'' and 28'' are aligned in coplanar relation they may be locked in this relation by bolt member 40 which is secured in position by tightening nut 40a against slotted plate member 39 represented in Fig. 21.

The frame member 28 is provided with symmetrically arranged component parts which are identical with the component parts explained in connection with frame member 29 including the plates 32 and 33 which coact with sets of plates 30 and 31 carried by angle frame 8b of frame member 8, the said plates being pivotally connected by bolts 34 and 35 all arranged in a manner similar to the correspondingly numbered parts heretofore described by reference characters bearing subscripts a. Similarly the locking bolt 36 is arranged to extend through the depending lugs 37 and 38 in a manner similar to the arrangement of locking bolt 36a heretofore described. The frame members 28 and 29 may be independently raised over the frame member 8 as represented for example in Fig. 3 in which the frame member 28 is shown in elevated position while frame member 29 is shown in coplanar position with respect to frame member 8.

The harrow disc assemblies 26 and 27 carried by frame members 28 and 29 are symmetrically arranged and are displaced from the center of the implement as shown in Fig. 1. The harrow disc assemblies 26 and 27 are disposed on axes extending at an obtuse angle which is symmetrically opposite to the obtuse angle on which the axes of harrow disc assemblies 14 and 15 extend. The discs are arranged in the harrow discs assemblies 26 and 27 in positions which are in echelon with respect to the discs in the forwardly disposed harrow disc assemblies 14 and 15 for insuring the pulverizing of the earth as the harrow is advanced over the field. I have designated the harrow discs in the harrow disc unit 26 at 41, 42, 43 and 44 spaced by sleeve members 45, 46 and 47 respectively. The component parts of the harrow disc assembly 27 have been designated by corresponding reference characters bearing subscripts a where the discs are designated as 41a, 42a, 43a and 44a spaced by sleeves 45a, 46a and 47a. In Fig. 4 I have shown the manner of assembling the harrow discs with the spacing sleeves therebetween and through which the bolt member 48a extends and is secured therethrough by the headed end 48a' bearing against plate 49a arranged at one end of the assembly and extending through plate 50a at the other end of the assembly and locked by means of nut 48a'' at the end of the assembly. The assembly for discs 41, 42, 43 and 44 is carried out in a similar manner.

The individually hinged frame members 28 and 29 are each polygonal in shape as represented in plan view in Fig. 1 and have the angle frames which interconnect the forward and rearward angle frames 28' and 28'' and 29' and 29'' inclined at an angle extending toward the rear of the implement. The angle of inclination of the side frame members 28''' and 28'''' and angle frames 29''' and 29'''' is such that when the multiple disc assemblies are mounted thereon with the axes of the assemblies extending normal to the direction of the angle frame members 28''', 28'''', 29''' and 29'''' the harrow discs are maintained at the proper obtuse angles for the most efficient operation in coaction with the forwardly disposed harrow units 14 and 15.

The manner of journalling the rearwardly disposed harrow units 26 and 27 has been illustrated more clearly in Figs. 4–8 wherein the manner of suspending the bearings from the angle frame members 29''' and 29'''' has been clearly brought out. It will be observed that bracket members 51a and 52a are secured to the vertically extending flange portions of the angle frame members 29''' and 29'''' respectively by bolt members 53a and 54a. The bracket members 51a and 52a depend downwardly and are provided with horizontally extending portions 51a' and 52a' which serve as supporting means for the journal boxes 55a and 56a. Each journal box is formed as represented more particularly in Fig. 7 by upper and lower complementary parts 56a' and 56a'' which are secured by bolt members 57a and 58a which extend through the horizontally extending flange 52a' and are secured by fastening nuts 57a' and 58a' to the top thereof. A similar arrangement is provided for connecting bracket 51a with journal box 55. The parts of the journal box 56a' and 56a'' enclose the combined spaced member and sleeve bearing 47a. The sleeve bearing 47a is shown in elevation in Fig. 8 as including a multiplicity of spaced flanges 47a', 47a'', 47a''' and 47a'''' distributed intermediate the end flanges $47a^{v}$ and $47a^{v1}$. The end flanges $47a^{v}$ and $47a^{v1}$ serve as spacer means bearing against the discs 44a and 43a while the intermediate flanges serve as bearing means to allow control rotation of the disc assembly within the journal boxes 55a and 56a. Lubrication is provided through the journal boxes 55a and 56a through the lubrication ports 60a and 61a. The associated harrow disc unit 26 is mounted in a manner similar to the harrow disc unit 27 on brackets 51 and 52 employing component parts for the bearings similar to the component described for mounting harrow disc unit 27.

I provide very special means for controlling the depth of cut for the harrow for either of the positions of the harrow; that is, with the multiple disc units operating in coplanar relation or with the rearward harrow disc units moved to superimposed position above the forward harrow disc units. This depth control mechanism is illus-

trated more clearly in Figs. 1–3 and 9–12. The depth control mechanism consists of a pair of screw members of opposite screw threaded pitch represented at 62 and 63. Screw member 62 terminates in a block 64 which is pivoted at 65 to the upwardly extended hitch frame 1. The screw member 63 terminates in a block 66 which is pivoted between brackets 66a mounted on angle frame member 8b at the rear of the front frame member 8. A cylindrical member 67 having axially extending screw threaded recesses 68 and 69 therein of right and left hand screw threads extends between and engage the screw threaded members 62 and 63. A hand wheel 69 is provided for revolving cylindrical member 67 for retracting or extending the screw threaded members 62 and 63 depending upon the direction of rotation of hand wheel 69. A nut 70 is provided on screw threaded member 62 and coacts with the end of screw threaded recess 68 serving to lock the expansion and contraction device into a predetermined set position when adjusted to a desired selected position. With frame members 28 and 29 locked in coplanar relation with frame member 8 the entire harrow frame may be elevated about the pivotal connections 1a and 1b with the tractor hitch frame for thereby elevating both the forwardly disposed harrow disc assemblies 14 and 15 as well as the rearwardly disposed harrow disc assemblies 26 and 27 and clearing the surface over which the implement is operated. When the locking bolts 36 and 36a are removed and frame members 28 and 29 shifted to angular positions superimposed over the forwardly disposed harrow disc assemblies the double screw device continues to function to elevate the harrow disc assemblies 14 and 15 above the surface over which the implement operates and in this position the tractor may move the harrow readily from one location to another or to and from the field in which the implement is to be used. Where the depth of penetration of the surface of the earth by the harrow discs must be controlled the double screw may be operated by hand wheel 69 to exert pressure between the tractor hitch frame 1 and the frames 8 and/or 8, 28, and 29 for directing the frames downwardly and inclined at such an angle that the harrow discs will penetrate the earth's surface to the desired degree thereby controlling the depth of cultivation by use of the implement of my invention with a very high degree of precision.

In Figs. 22–27 I have shown a modified form of my invention in which a special hinge construction is substituted for the plate members 31, 31a and 33 and 33a heretofore described. In this modified arrangement the frame members 28 and 29 are provided adjacent their interior sides with horizontally extending vertically disposed plate members 71 and 71a, which are welded to the rear frame members 28 and 29, respectively, and project over the front frame member 8. The front frame member 8 carries coacting vertically extending curved plates 72 and 72a which have a peripheral dimension greater than 180°. The shape of these plates 72 and 72a is shown more clearly in Fig. 26 where the center of the plate is located at 73a displaced above the top plane surfaces of the frame members 8, 28 and 29. That is to say, the plates 72 and 72a are larger than semi-circles and enable the plate members 71 and 71a to be journaled therein by bolt members 74 and 74a which extend through the central apertures 73 and 73a in plate members 72 and 72a. This enables the trailing frame members 28 and 29 to be raised with respect to the leading frame member 8 about the centers provided by bolt members 34 and 34a heretofore described, and the bolt members 74 and 74a provided in the special hinge units constituted by plates 71—72 and 71a and 72a.

The circular plates 72 and 72a are each provided with spaced apertures which I have designated at 75a, 76a, 77a and 78a in Fig. 26 and which correspond to similarly numbered apertures without the suffix a provided in the correspondingly identified plate 72. These spaced apertures are adjacent the peripheral edge of each curved plate and spaced at such increment of distance as will enable bolt members 74 to be detachably extended therethrough for selectively maintaining the rear or trailing frame members 28 and 29 in a selected angular position with respect to the forward or leading frame member 8. For example in Fig. 22 the remote harrow unit 26 is shown elevated in a position at approximately 45° with respect to the plane of the axes of the forward harrow units represented at 14 and 15 by the passage of bolts 74 and 74a through apertures 76 and 76a in plates 72 and 72a. I refer to the apertures 76 and 76a in order to designate the corresponding apertures in the similar plate members 72 and 72a.

In Fig. 23 I have shown the remote trailing harrow unit 26 elevated to vertical position in which the frame 28 is secured by bolt 74 passing through aperture 77 in plate 72.

It will also be understood that the rear or trailing harrow units 29 and 27 may both be moved to a position directly over the forward or leading harrow units 14 and 15 and maintained in position by bolt members extending through apertures 78 and 78a in plate members 72 and 72a.

The other parts of the modified form of equipment shown in Figs. 22–27 are identified with the elements heretofore described in connection with Figs. 1–21.

In the operation of the harrow of my invention the complete unit as shown in Fig. 2 is raised when it is desirable in turning the unit around. The entire unit is also raised above the ground level for transport to and from the locations in which the unit is to be used. This raising operation is effected by the hydraulic system of the tractor and the three-point implement hook-up attachment which is a part of the tractor.

Precision control of the depth of penetration of the harrow disc blades is effected primarily by the hydraulic system and hook-up attachment. The harrow unit is of the order of 730 lbs. in weight and the four disc gangs are originally attached to the main frame at fixed angles. The arrangement is such that there is a tendency for the harrow to produce a deeper depth of penetration than is desirable, and also constitutes a load resistance that may be greater than the tractor capacity. Under these conditions the desired depth of penetration is regulated by moving the hydraulic control lever on the tractor up or down for correspondingly angularly shifting the complete harrow unit.

In raising and lowering the complete harrow unit the hitch frame 1 remains in a substantially vertical position throughout the up and down movement of the complete unit as controlled by the hydraulic system and hook-up attachment. The frame member designated at 8 also remains in a substantially horizontal position. The hand

wheel 69 on the cylindrical member 67 may be revolved to operate the screw threaded members 62 and 63 to regulate the depth of penetration of the rear sets of harrow discs 26 and 27 in relation to the penetration by the front sets of harrow discs 14 and 15. If the adjustable cylindrical member 67 is revolved to lengthen the effective length of screw threaded members 62 and 63 the rear end of frame member 8 and the coacting frames 28 and 29 move below a horizontal gear line position and permits the rear sets of blades 26 and 27 to cut deeper than the front sets of blades 14 and 15. By reversing the adjustment of hand wheel 69 the cylindrical member and associated screw members 67 are shortened in their effective length so that the frame member 8 and the associated frame members 28 and 29 will move above a horizontal center line position and permit the front sets of disc blades 14 and 15 to make a deeper penetration and deeper cut than the rear blades 26 and 27. The left and right hand threads on screw threaded members 62 and 63 coacting with the cylindrical member or adjustment strut 67 assure a very accurate and exact adjustment of the position of the harrow discs.

By use of the implement of my invention the effective ballast of the implement is readily controlled by either the distributing of the mass of the harrow units in coplanar relation as represented in Figs. 1 and 2 or concentrating the effective mass of the harrow units by the superimposed relation of the multiple disc units as represented by one of such units in the position illustrated in Figs. 3, 22 and 23. I have found the double screw device of my invention highly effective in the precision control of the depth of cultivation.

While I have described my invention in certain of its preferred embodiments which have been found to be particularly effective in production, manufacture and use, I realize that modifications may be made and I desire that it be understood that no limitations upon my invention are intended other than may be imposed by the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States is as follows:

1. A multiple lift-type disc harrow comprising a coupling frame connectible to a tractor, a frame member connected with said coupling frame, gangs of discs carried by said frame member, a pair of separate frame members disposed side by side individually hingedly connected with the rear of said first mentioned frame member, and movable through an orbit appreciably greater than 90 degrees in the direction of said first mentioned frame member, gangs of discs carried by said pair of frame members, said first mentioned frame member carrying connecting means on the trailing edge thereof, and said pair of separate frame members carrying connecting means on the leading edges thereof aligned with the aforesaid connecting means, and disconnectible means interconnecting the aligned connecting means on both said frame member and the rearwardly disposed separate frame members for maintaining said pair of frame members in coplanar relation with respect to said first mentioned frame.

2. A multiple lift-type disc harrow as set forth in claim 1 which also includes additional disconnectible means interconnecting said pair of separate frame members, all of said disconnectible means when disconnected permitting said separate frame members to be individually and separately moved from a coplanar position with respect to said first mentioned frame member to a position over and above said first mentioned frame member.

3. A multiple lift-type disc harrow as set forth in claim 1 in which said pair of separate frame members have individual widths which are substantially one-half the width of said first mentioned frame member and where said pair of frames may be selectively oriented to a position over said first mentioned frame.

4. A multiple lift-type disc harrow as set forth in claim 1 in which the connecting means on the trailing edge of said frame member are substantially U-shaped and depend downwardly beneath the said frame member and wherein the connecting means on the leading edges of the pair of separate frame members comprise depending spaced members extending in alignment with the aforesaid U-shaped members and wherein the disconnectible means interconnecting the aligned connecting means on both said frame and the rearwardly disposed separate frames constituted by both members extend through said U-shaped members and between said depending spaced members and are fastened with respect thereto.

5. A multiple lift-type disc harrow as set forth in claim 1 in which the connecting means on the trailing edge of said first mentioned frame member depend beneath the plane of said frame member and where the connecting means on the leading edges of said pair of separate frame members depend beneath the planes of said separate frame members in alignment with the aforesaid connecting means and wherein the disconnectible means interconnecting the aligned connecting means extends below the planes of both said frame and said pair of frame members when said pair of frame members and said frame member are disposed in coplanar relation.

6. A multiple lift-type disc harrow as set forth in claim 1 in which said pair of separate frame members abut with each other at the trailing edges thereof and have disconnectible means for fastening the rear edges of said pair of frame members in coplanar relation with respect to said first mentioned frame member and in coplanar relation with each other.

7. A multiple lift-type disc harrow as set forth in claim 1 in which said pair of separate frame members terminate in mutually abutting members wherein one of said members carries a disconnectible means therein and the other of said members includes a downwardly disposed substantially V-shaped notch operative to engage said disconnectible means when said pair of separate frame members are disposed in coplanar relation with respect to said first mentioned frame member and in coplanar relation with each other.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
2,098,116	Warne	Nov. 2, 1937
2,101,187	Olson et al.	Dec. 7, 1937
2,352,963	McMahon	July 4, 1944
2,389,993	Mitchell	Nov. 27, 1945
2,398,147	McKay	Apr. 9, 1946
2,421,306	White	May 27, 1947
2,440,550	Martin	Apr. 27, 1948
2,456,693	Fraga	Dec. 21, 1948