



DESIGN AND MANUFACTURING OF THE COMPOUND DISC MACHINE (TILLAGE, DITCHER AND DISC RIDGER)

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Abstract

The experiment was carried out in the General Company for the manufacture of cars and equipment / mechanical equipment in Iraq was developed for a disc machine to perform three different agricultural operations (tillage, ditcher and disc ridger) using the same machine. This is after developing a simple design for a new structure that can use the same two disk groups that were used in the tablet (ridger) with factory code (21-00-000) to perform the three operations referred to above after changing the location of linking the two groups of discs to the new structure and organizing the tilt and disc angles For each group and according to the required process, a prototype of the machine was manufactured and tested in the field of company experiments and proved successful.

Key words: compound disc machine, disc plow, ditcher, disk ridger.

Introduction

Soil tillage is considered to be one of the important processes affecting on physical and mechanical properties of soil (Keshavarzpour and Rashidi, 2008) thereby creating a desirable soil condition for seed germination and growth through improvement the pulverization of soil (Ati *et al.*, 2014).

Equipment's of soil preparation can be classified according to usage into three groups, which are primary, secondary and special soil treatment equipment (AL-Jarrah *et al.*, 2006) each equipment can achieve a specific process differ from the rest of the equipment in terms of the type of transaction and its technical requirements and it will be not possible to achieve another treatment unless using different equipment that its design will be suitable to achieve this process.

It is one of the tipper plows that achieve the process of disturbing and tipping the soil by the discs rotational movement. The disc plow deploy the same tasks that tipping moldboard plow can do, but with some advantages where (Manian and Rao, 2000; Hamid, 2012) refers to when considering the design shape of the disc plow and its rigid fabrication it is higher significant to satisfy the

agriculture technical requirements than the moldboard plow. And the possibility of using the disc plow in different climate and soil conditions is bigger than what is it with the moldboard plow.

It confirms (AL-Jarrah *et al.*, 2006) that despite the farmers bias towards the moldboard plow, scientific opinion and research results even inside Iraq indicate that the disc plow was more beneficial and less harmful to the soil compared to the moored plow. He also pointed out the distinction of the disc plow on moldboard during work in sticky clay lands and the areas infested with weeds and covered with thick vegetation. As well as hard dry lands, including clay soils in the rainy areas and soils of the central and southern regions of Iraq, as well as its distinction in working in endemic lands With stones and sandy and coarse textures with high abrasion and wear. Likewise, lands that are located in climatic conditions help to rapidly decompose the organic matter, including Iraq. Also emphasized the distinction of the disc plow in reducing the harmful effect on erosion-prone soil compared to the mowed plow. The ability of the disc plow to reach the depth of tillage is greater in ideal soil conditions compared to the mower plow. But he also indicated that he may sometimes need to use additional weights attached to the plow structure to increase the

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penetration of the disks. However, along with all the above advantages, the appearance of plowing is rougher than that of a mower plow and the roughness of the treated soil can be reduced through good regulation of both the tilt angle and the angle of the disc. The value of the inclination angle ranges between 25-15 degrees and a mechanism is available to regulate it in all disc plows. As for the angle of the disk, it is in most of the plows that are fixed and if there are some automatic designs for changing them, they are by changing the angle of the structure attached to the disk groups with the suspension set.

This factor (the absence of a mechanism for regulating the angle of the disk) represents a large specific and extremely influencing the performance of the disc plow and hence the demand for it. Therefore, the presence of a mechanism to change the angle of the disk will be able to choose the working width appropriate to the soil conditions and the speed of treatment and thus balance the plow behind the puller in all working conditions (Abdalla *et al.*, 2014). And also for Ditcher opens a groove in the treated soil and throws the soil resulting from opening the groove on both sides of the groove, forming what is called a watering. Ditcher is used to deliver irrigation water from secondary irrigation canals to the field. Ditcher consists of a structure to which a semicircular rail is attached to the front, followed by two stripes, one from the right and the other from the left, which are placed with one side penetration angle and topped with two hammers, with their concave sides outside, to put up the soil that the rail separates and raises to the mills to establish the waterwheel. Disk ridger Salinity or Butane is defined as a equipment that collects the soil from the sides towards the medium to be raised, called Ridger and thus it reflects the work of ditcher (Singh *et al.*, 2011)

This stomach is classified as special soil equipment. There are two types:

1. Mouldboard ridger: The working parts in this type consist of two concave cylindrical panels inside, the ends of which are released from the front and narrowed from the back, so the soil moves inward during the passage of the stomach and collects at the back end on two bodies.

2. Disk Ridger: It does the same thing as tablet lattice, but the one that works here is rotating disks instead of Mouldboard, which are of two types.

A. Single-disc; B. Multiple discs.

Materials and Methods

The basic idea of the new machine was put in the section of the assembly of agricultural machinery, where it was thought to benefit from the opposite of salinity and ditcher work as we noted in the introduction to the

research. Consequently, taking advantage of the two sets of salinity disks (which dug half of the legs or groove from each side and made a pit of soil resulting from digging in the middle) in creating a wheel instead of the bats after switching their positions where one of them replaces the other (right to the left and left to the right) and so you Each group opens half of the waterwheel and subtracts the resulting soil on both sides of the waterwheel, thus creating a complete waterwheel.

In order to achieve the idea, the two groups' locations were changed on the original structure (the structure of the salinity 21-01-000) and it became evident during the assembly process that even when the rules for linking the two groups on the structure are found (sheet 21-02-402), there will remain an opening between the two disks from the front representing Untreated area of the soil with a width of 120 mm from the middle and a height similar to the cutting depth (250 mm), which will collapse in the centre of the wheel after the machine passes, thus distorting the process of establishing the water wheel technically (Dimensions and the final form). In order to solve this problem, it is necessary to place the two sets of disks in succession, one behind the other. This means designing a new structure to complete the work of the machine, which enables the two sets of discs to be connected to a cross-position to make the ridger and to a consecutive position to open the water. This requires the new chassis design to have two successive axes to connect the two disc groups.

In order to determine the dimensions of the new structure, the left group was left bound to the original structure 21-01-000 and the right group was suspended, raised and moved by the bridge crane instead of the hand to be precise in controlling the dimensions. And put it behind the left group to determine the distance between the axle of the new structure (the original axle 21-01-801 and the default new axis) and set the distance to 760 mm and given what was observed during the field tours, especially during the assignment of the combine harvesters campaigns of wheat and barley crops and in various regions of Iraq we noticed During recent years, due to water scarcity and frequent interruptions of electric current, we have noticed the tendency of farmers to reduce the size of the board and thus reduce the height and width of the separating stove between the panels to increase the speed of watering the panels and reduce the water losses. This had a major impact on the smooth movement of combine harvesters in the fields and the reduction of losses and holidays that occurred when harvesters crossed the big lepton. This pushed us to reduce the dimension between the discs in the new machine if they were attached as salinity and make it 520 mm instead of 800 mm.

Results and Discussion

Disc plow

Disc plows of the General Company for the manufacture of cars and equipment / mechanical factory with factory code 131-00-000 and 141-00-000. Since its inception, the company has produced triple disc plows 131-00-000 and quadrilateral 000-141-00, fig. 1 and below, the specifications of plow 131-00-000.

The type is suspend

The number of bodies (3)

Tilling depth is (250) mm

The working width is (800) mm

The diameter of the disc is (711) mm

The thickness of the disc is (8) mm

The tilt angle of the disc is adjustable from (25-15) degrees

The angle of the disc is fixed (48) degrees.

The sales of these plows were not in a manner that would guarantee the continuation of their production. Therefore, these plows were canceled from standard production for the following reasons:

1. The size of the machine, where the weight of the plow 131 reaches 470 kg and 141 to 592 kg, which reduces its marketability, as the Iraqi farmer and farmer want relatively light machines, because most of the pullers that are introduced to the country are medium-horse pullers of 80-70 hp.

2. The unbalance of the rear wheel group 131-04-000 (which is similar in its function to the footrest or field board in moored plows) is parallel to the lateral forces that represent the lateral reaction of the soil to the tillage discs, causing the plow to deviate during work and its instability behind the tug and thus not to The puller itself stabilizes during work, due to the lack of a mechanism to



Fig. 1: Disc plow.

change the angle of the disk, (2). This is because the pillar 131-01-302 to which the disc assembly connects 131-02-000 welds directly to the tubular structure 131-01-801 thus the angle of the disc cannot be changed.

Ditcher

Ditcher is available in several sizes. Large ones are either withdrawn or semi-suspended, such as the ditcher produced by the company 190-00-000. This ditcher was canceled due to its large size and lack of appetite among farmers and farmers. As for the medium and small sizes, it is suspended behind agricultural pullers, including ditcher 191-00-000 and 192 -00-000 fig. 2.

Below are the specifications of the machine 00-00-191

Ditcher width from bottom (200) mm

Ditcher width from top (1200) mm

Ditcher depth (500) mm

Weight (175) mm

These ditchers pioneers have several problems, including:

1. The precipitation of the soil in the open stalk after the passage of the light due to the height of the Mouldboard from the bottom of the stalk, especially if the soil is sandy or heavily fortified.

2. The presence of several problems in the suspension device, the most important of which is the occurrence of cracks and cracks in the parts of the weak and inefficient device.

3. As the openings 191 and 192 are classified among the medium size openings and given the water scarcity conditions and the mentioned interruptions of the electric current through which the diameter passes, the peasants tended to acquire the small size openings in order to reduce the water losses in the waterways, which led to the company's decrease in sales in a way Large.



Fig. 2: Ditcher.

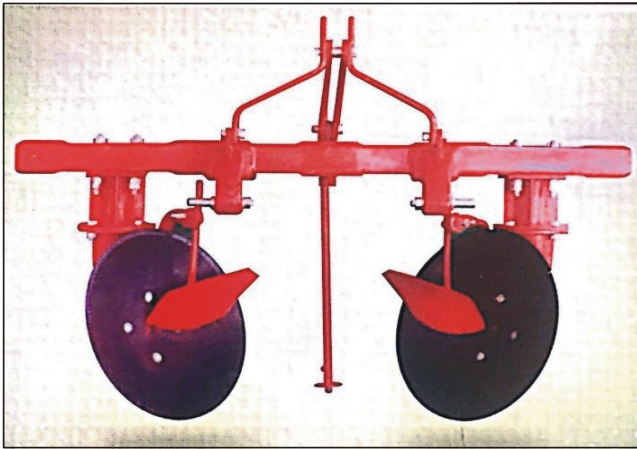


Fig. 3: Ridger.

Ridger

Manufacturer code disc 21-00-000 Salinity 21-00-000 fig. 3 is considered one of the most successful machines in the circumstances of Iraq and is characterized by its good design and strong structure and proven, during nearly thirty years of its production in the company, its efficiency and durability in the work and it won a good reputation among farmers. Below are the technical specifications of the machine:

The length is (720) mm

Width (2112) mm

Height (1400) mm

The diameter of the disc is (711) mm

The thickness of the disc is (8) mm

The distance between the two discs is adjustable from (800 – 0) mm

Weight (347) kg

The tilt angle of the disc is adjustable from (25-15) degree

The angle of the dial is adjustable from (45-21) degree.

Compound manufacturing machine

The new design of the structure was developed based on the new dimensions and is characterized by simplicity

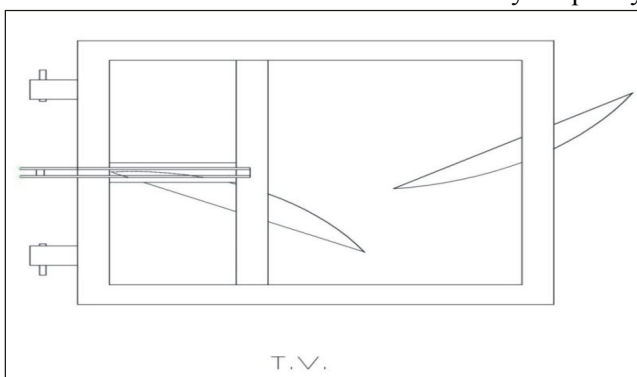


Fig. 4: Ditcher.

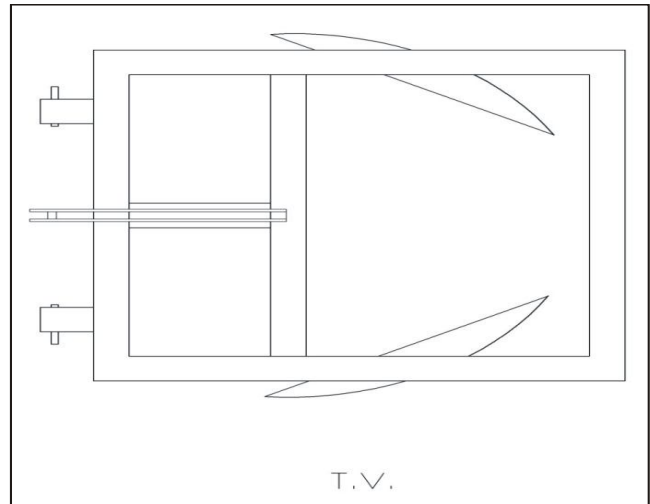


Fig. 5: Ridger.

and durability. After completing the design, a model was produced for the new structure and the two sets of disks were attached to it as a Ditcher (Fig. 4) and connect the disc group as Ridger (Fig. 5) so the compound disc machine in (Fig. 6).

The form was referred to the Research and Development Department, the Department of Agricultural Drawers and Machinery Research to test and express an opinion on it. After receiving the form, the design maps file for the original salinity disc 21-00-000 was brought in and studied to see the differences between the two before conducting the experiments. While looking at the design maps, we noticed that the disk group was symbolized by the symbol 131-02-000, while the salinity symbol was 21-00-000, meaning that the disk group symbol should have started With the number 21 and not 131, then the code is supplemented with 02-000 and after inquiry from the Department of Agricultural and Agricultural Researches, it turns out that this group (disk set 131-02-000) is completely borrowed from triple plow maps 131-00-000 and cancelled from production for the reasons



Fig. 6: Compound Disc Machine.

that passed Mentioned in the introduction to the research. This matter led us to think about the possibility of using the machine as a dual disc plow (in addition to using it as a Ditcher, Ridger and according to the design of the agricultural machinery section), which will have the advantage of changing the angle of the disk that was fixed in the cancelled plows 131 and 141, which, as we noted in the introduction to the research, was one of the main reasons Cancel these plows. This is because in plows 131 and 141, the disk group connects to the chassis by first connecting it to the base connecting the post. 131-01-304 with bolts 131-00-604 (2). The base connection of the post is 131-01-304 welded to the post 131-01-302, which in turn is welded to the tubular structure 131-01-801, thus the angle of the disc assembly remains constant and cannot be changed. As for the Ridger 21-00-000, there is an additional group, the cylinder group 21-02-000, which connects to the structure by means of a special screw 141-01-601 quantity (2) and not by welding. The upright 21-03-302 (which stands here as the upright from 131-01-302) is connected to the cylinder block by screw (M 20 ×45) In quantity (4) and the 21-03-302 connects the base to the upright 131-01-302 which connects Disk group mechanism. The design of the cylinder group 21-02-000 and the existing 21-03-302 enables the rotating of the cylinder assembly to an angle from 45-21 degrees. This means that the angle of the disc assembly that is attached to the base of the connecting rod can be changed 01313-131 and this is what distinguishes the new machine at Use it as a plow from previous plows 131 and 141. In the meantime, the machine was tried as a light driver and a saltman and proved successful. Then the machine was attached in the form of a double disc plow (Fig. 7) and was tested with an 80-hp agricultural tug after it was attached to the rear disc group the rear wheel group 131-04-000 and the machine proved successful after field trials.

Below are the specifications of the new machine:

Height (1350) mm

Width (1450) mm

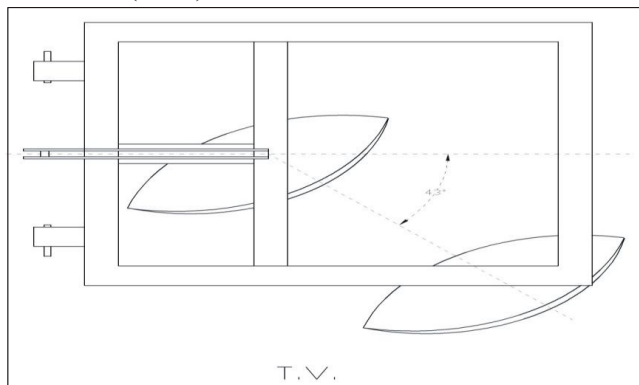


Fig. 7: Disc plow.

Height (1400) mm

The diameter of the disc is (711) mm

The thickness of the disc is (8) mm

Disc and tilt angles are similar to ridger (000-00-21).

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Recommendations

We recommend the State Company for Automotive Industry and Equipment / mechanical laboratory to produce this machine and promote it as being successful and solid and cut down to the farmer the cost of purchasing three agricultural machines as it is a three-in-one agricultural machine.

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