

TRACTOR/IMPLEMENT LINKAGE

This invention relates to linkages whereby an implement is mounted on a tractor.

Conventionally implements are connected to tractors by three point linkages having two lower links which are connected to respective horizontally-spaced brackets on the implement and an upper link which is connected to an implement bracket spaced above and between the lower brackets. The lower links are raised and lowered to lift and lower the implement relative to the tractor and the lower links and upper link are constructed to be generally in the nature of a parallelogram linkage. Accordingly during lifting and lowering the implement is maintained in a generally horizontal position and the amount of elevation of the implement is in direct relationship to the vertical movement of the lower links.

When the implement is powered by the power take-off shaft of the tractor, as, for example, in a rotary cultivator, a transmission shaft is connected by universal joints to the tractor power take-off shaft at one end and to the power input shaft of the implement at the other end. To operate satisfactorily in the elevated and lowered positions the tractor power take-off shaft and the implement input shaft should maintain generally equal angles to the transmission. This normally precludes the elevation of the implement other than in the mode described, i.e. with the implement remaining generally horizontal.

However the elevation of the implement above the ground which can be achieved with conventional three point linkages is limited and is inadequate for some applications. For example in cultivating rice padi

fields with rotary cultivators it is necessary to pass from one field to another over bunds consisting of earth embankments. In surmounting such obstacles a tractor and conventional rotary cultivator combination having a standard three point linkage is often unable to pass over the bund without the rotary cultivator coming into contact with and damaging the bund. To overcome this problem the bund has to be reduced in height and then built up again, or the bund has to be suitably contoured in a manner which is wasteful of available land.

It is an object of the invention to provide a linkage for connecting an implement to a tractor which makes possible a relatively high elevation of the implement in relation to the tractor and which is suitable for implements powered by the tractor power take off

According to the invention a ~~tractor~~ linkage for mounting an implement on a tractor having a three point linkage including a pair of bottom links and top link attachment means, comprises a top link, mounting means on the implement for pivotally connecting one end of the top link to the implement about a horizontal axis, the other end of the top link being pivotally connectable to the top link attachment means on the tractor, and mounting means on the implement for pivotally attaching the bottom links about horizontal axes to the implement, the top link mounting means being disposed below the bottom link mounting means in the upright position of the implement so that as the bottom links are raised to elevate the implement the implement tilts forwards about the axes of the mounting means.

The linkage preferably comprises a drive shaft connected

5 through a universal joint to the tractor power take-off shaft at one end and through another universal joint to an implement input shaft at the other end to thereby power the implement, the drive shaft in the operative lowered position of the implement making an angle with the power take-off shaft which is oppositely inclined to the angle the drive shaft makes with the implement input shaft, and in an elevated position of the implement the angle of the drive shaft to the power take-off shaft is complementary to the angle of the drive shaft to the implement input shaft. This arrangement compares with the conventional linkage in which the power take-off shaft is inclined to the drive shaft in the opposite direction to that of the implement input shaft in both the lowered and elevated positions.

10 Preferably the top link includes two arms the forward ends of which are connected to the top link attachment means, the arms diverging rearwardly for connection to the top link mounting means which comprises horizontally spaced brackets.

20 Conveniently the top link arms pass to either side of a drive shaft drivingly connected between the tractor and the implement and the top link mounting means are located between the bottom link mounting means.

25 Further features of the invention will appear from the following description of an embodiment of the invention given by way of example only and with reference to the drawings in which:-

30 Fig. 1 is a side elevation of an implement/tractor combination showing the implement in a lowered position.

Fig. 2 is a plan view of the combination of Fig. 1, and

Fig. 3 is a side elevation corresponding to Fig. 1 with the implement in a raised position.

Referring to the drawings a tractor 10 (only part of which is shown) is of conventional form having rear wheels 11 and a body 12. At the rear of the body 12 are two powered bottom links 13 and 14 of a three point linkage, the links 13 and 14 being pivotally attached to the body 12 in known manner. Brackets 15 on the body 12 and spaced above the bottom links provide for the pivotal attachment of a top link 16 in conventional manner; however the top link 16, in this arrangement, is not of conventional form and instead is in the form of an A frame. The A frame has a common attachment point at its forward end for attachment to the brackets 15 and two arms 18 and 19 diverge rearwardly for pivotal attachment at their rear ends to brackets 21 and 22 attached to an implement 25, the pivot axes lying horizontally.

The bottom links 13 and 14 are pivotally attached about horizontal axes to brackets 23 and 24 on the forward end of the implement 25.

In the upright position of the implement 25 (Fig. 1) the horizontally-spaced top link brackets 21 and 22 project forwardly and downwardly from a transverse bar 26 forming part of the implement frame and the bottom link brackets project upwardly and forwardly from a transverse bar 27 forming another part of the implement frame so that the attachment points 28 and 29 of the top link arms 18 and 19 lie below the attachment points 30 and 31 attaching the bottom links 13 and 14 to the implement. It will also be noted (Fig. 2) that the bottom links 13 and 14 and associated brackets 23 and 24 are spaced outwardly in a direction transverse to the direction of

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travel A from the top link arms 18 and 19 and their associated brackets 21 and 22. The vertical spacing between the attachment points 28 and 29 and attachment points 30 and 31 is substantially the same, in the upright position, as the vertical spacing between the attachment points of the upper and lower links to the tractor.

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The implement 25 is, in this case, a rotary cultivator of generally known form having a transverse frame 33 with side members 34 and 35 between which is mounted a transverse shaft (not shown) having a horizontal axis 36. Ground working tools 37 are mounted on the shaft and the shaft is driven to rotate the tools 37 by a drive transmission including an input shaft 38 to a gear box 39, and a jack shaft 40 from the gear box to a side drive in a housing 41, the side drive being drivingly connected to the shaft carrying the tools 37. The implement 25 also has depth control wheels 42 and a trailing shield 43.

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In the operating position, as shown in Fig. 1, the input shaft 38 to the gearbox 39 is disposed horizontally and is connected to a transmission shaft 45 through a universal or constant velocity joint 44. The transmission shaft 45 is in turn connected to the tractor power take off shaft 46 through a further universal joint 47 all in known manner. Since the tractor power take off shaft 46 is directed with its axis horizontal it will be seen that in the operating position of Fig. 1 the power take off shaft 46 and the implement input shaft 38 are generally parallel to one another and extend at the same angle and in opposite directions to the transmission shaft 45, thus providing for satisfactory operation of the drive transmission to the implement in this position.

Referring now particularly to Fig. 3, it will be seen that when the implement 25 is moved to an elevated position by raising the bottom links 13 and 14 in the usual manner, the top link pivots about the top link brackets 15 and the implement pivots about the attachment points 28, 29 and 30, 31. Due to the geometry of the linkage the implement is tilted forwards as it moves upwards to adopt the position shown in Fig. 3. This action gives a higher elevation to the lowermost part of the implement than is achieved with the conventional linkage without any increased elevation of the bottom links. Moreover the tools 37 are at or above the lowermost part of the implement.

When the implement is in the elevated position of Fig. 3 it will be seen that the angle of the implement input shaft 38 to the drive shaft 45 is complementary to and inclined in the same direction as that of the tractor power take-off shaft 46 relative to the transmission shaft 45. Thus drive can be transmitted to the implement while it is in the raised position without adverse effect on the drive transmission system. Although the angle of the input shaft 38 to the drive shaft 45 is not necessarily the same as that of the take off shaft 46 to the drive shaft 45 the shafts can be kept running during elevation of the implement.

The disposition of the top link and its arms 18 and 19 enables the drive shaft 45 to be accommodated between the arms during up and down movement and the implement is given extra stability. Moreover, in the elevated position the weight of the implement is carried largely on the bottom links 13 and 14 which helps tractor stability.

It will be appreciated that although the invention will find particular application with tractor powered implements it can also be used with other three point linkage mounted implements which require the high lifting capability facility offered.



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CLAIMS

1. A ~~tractor~~ linkage for mounting an implement on a tractor having a three point linkage including a pair of bottom links and top link attachment means, comprising a top link, mounting means on the implement for pivotally connecting one end of the top link to the implement about a horizontal axis, the other end of the top link being pivotally connectable to the top link attachment means on the tractor, and mounting means on the implement for pivotally attaching the bottom links about horizontal axes to the implement, the top link mounting means being disposed below the bottom link mounting means in the upright position of the implement so that as the bottom links are raised to elevate the implement the implement tilts forwards about the axes of the mounting means.
2. A linkage according to claim 1 comprising a drive shaft connected through a universal joint to the tractor power take-off shaft at one end and through another universal joint to an implement input shaft at the other end to thereby power the implement, the drive shaft in the operative lowered position of the implement making an angle with the power take-off shaft which is oppositely inclined to the angle the drive shaft makes with implement input shaft, and in an elevated position of the implement the angle of the drive shaft to the power take-off shaft is complementary to the angle of the drive shaft to the implement input shaft.



3. A linkage according to claim 1 or 2 wherein the top link includes two arms the forward ends of which are connected to the top link attachment means, the arms diverging rearwardly for connection to the top link mounting means which comprises horizontally spaced brackets.
4. A linkage according to claim 3 wherein the top link arms pass to either side of a drive shaft drivingly connected between the tractor and the implement and the top link mounting means are located between the bottom link mounting means.
5. A linkage according to any one of the preceding claims wherein the top link mounting means includes brackets extending forwardly and downwardly of the implement, and the bottom links mounting means includes brackets extending upwardly and forwardly of the implement.
6. A linkage according to any one of the preceding claims wherein the axis of the top link mounting means is spaced in the vertical direction from the axis of the bottom link mounting means a distance substantially equal to the vertical spacing between the top link attachment means and the attachment of the bottom links to the tractor.
7. A linkage according to any one of the preceding claims wherein, when the implement is in an elevated position, earthworking tools of the implement are located at or above the lowermost portion of the implement.
8. A ~~tractor~~ linkage for mounting an implement on a tractor substantially as described with reference to the drawings.