Design of a partially Parallel Stump Jump Mechanism

using

Computer -Aided Design

by

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Declaration

This work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text.

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Date 25/5/92

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Abstract

Change in tillage practice over the past decade has been greatly influenced by two factors namely the need to reduce energy consumption in tillage operations and the retention of crop residue as a soil conservation measure. These changing cultural practices have greatly influenced tillage tool design. One response to these changes involves the design of a partially-parallel stump mechanism to cope with the new conditions. In this research computer aided design is used to improve the design of a partially parallel stump jump mechanism which was initially developed by Riley. The principal aim is to reduce the existing link dimensions of the mechanism so that it can be suitable for use on small tractors.

To achieve the above aim, kinematic analysis was performed by using the LINCAGES-4 computer software package for sizing of the links. The mechanism was designed for chisel ploughing for fluctuating load with average horizontal and vertical soil forces of 2.5 kN and 1.0 kN respectively. Force analysis was carried out using the MICRO-MECH software package for calculation of joint forces. For the stress calculation impact and fatigue phenomena were taken into consideration and a separate computer-aided finite element analysis was performed on individual links of the mechanism. The result obtained from the kinematic analysis shows that there was an improvement in the dimensions of the links. The driver link has been reduced from 600 mm to 363 mm, the coupler link from 400 mm to 303 mm and the follower link from 400 mm to 306 mm.