Design and Fabrication of Manually Operated Agro paddy Cutting Machine

Abstract— This machine targets the small scale farmers who have land area of less than 2 acres. This machine is compact and can cut up to two rows of plant. It has cutting blades which cut the crop in a scissoring type of motion. It runs on wheel is provided through pulley and gear box arrangement to the cutter. This harvester might be the solution to the problems faced by a small scale farmer regarding cost and labor implementation

1 INTRODUCTION

Farming is most widely followed profession in India. Agricultural products contribute a major portion to our economy. Engineering science has brought tremendous changes in traditional methods of agriculture viz. sowing, planting, irrigation, fertilizer spraying, harvesting, etc. However to increase our economic condition, we must increase the productivity and quality of our farming activities. These reapers are costly and only available of very large scale farming. This machine is cost effective and easy to maintain and repair for the farmers. This demand is taken into consideration by consulting farmers in person, for their problems and requirements. Taking into account the present scenario of crop harvesting we decided to prepare a model of crop reaper with compact construction which will be mostly suitable for farmers having small land for agriculture. The machine prototype will be economical and most convenient for cutting carp stalks and other similar plants having same or less shear strength than corn. Harvesting is the process of gathering a ripe crop from the fields.

2. METHODOLOGY AND WORKING

2.1 Objectives

- Aim of this project is to design and fabricate small scale low cost compact reaper and chopper machine which reduce the overall cost of grain harvesting in the form of labour cost and harvesting cost.
- The idea is to provide the equipment with a reasonable cost for our farmers to end the tedious handwork, in addition the idea is also to incorporate onsite chopping and collection facility.
- Increase profit with modern machine.

2.2 Methodology

Components: The Scotch Yoke mechanism is used for converting rotary motion into a reciprocating motion.

Shaft: A shaft is a rotating or stationary component which is normally circular in section. A shaft is normally designed to transfer torque from a driving device to a driven device.

Mechanical components directly mounted on shafts include gears, couplings, pulleys, cams, sprockets, links and flywheels. A shaft is normally supported on bearings. The torque is normally transmitted to the mounted components using pins, splines, keys, clamping bushes, press fits, bonded joints and sometimes welded connections are used

Pedestal bearing:

Pedestal bearing (Pillow blocks) is also known as housings which have a bearing fitted into them. Pillow blocks are usually mounted in cleaner environments and generally are meant for lesser loads of general industry. The fundamental application of the pedestal bearing is to mount bearings safely enabling their outer ring to be stationary . Thus the housing provides a clean environment for the expensive bearings to freely rotate, hence increasing their performance and duty cycle. Bearing housings are usually made of grey cast iron. However various grades of metals can be used to manufacture the same.

V-Belt Pulley:

The pulleys are used to transmit power from one shaft to another by means of flat belts, V-belts or ropes. Since the velocity ratio is the inverse ratio of the diameters of driving and driven pulleys, therefore the pulley diameters should be carefully selected in order to have a desired velocity ratio. The pulleys must be in perfect alignment in order to allow the belt to travel in a line normal to the pulley faces. The pulleys may be made of cast iron, cast steel or pressed steel, wood and paper. The cast materials should have good friction and wear characteristics. The pulleys made of pressed steel are lighter than cast pulleys, but in many cases they have lower friction and may produce excessive wear. In this, I have used a Cast Iron Pulleys.

V-Belt:

Generally, we know that a V-belt is mostly used in factories and workshops where a great amount of power is to be transmitted from one pulley to another when the two pulleys are very near to each other. The V-belts are made of fabric and cords molded in rubber and covered with fabric and rubber as shown in Fig. below. These belts are molded to a trapezoidal shape and are made endless. These are particularly suitable for short drives. The included angle for the V-belt is usually from 30° to 40°. The power is transmitted by the wedging action between the belt and the V-groove in the pulley or sheave. The wedging action of the V-belt in the groove of the pulley results in higher forces of friction.

Bevel gear:

Two important concepts in gearing are pitch surface and pitch angle. The pitch surface of a gear is the imaginary toothless surface that you would have by averaging out the peaks and valleys of the individual teeth. The pitch surface of an ordinary gear is the shape of a cylinder. The pitch angle of a gear is the angle between the face of the pitch surface and the axis.

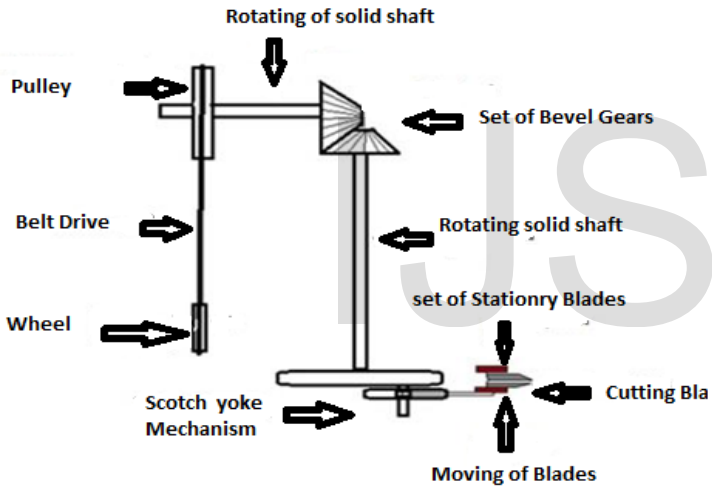
The most familiar kinds of bevel gears have pitch angles of less than 90 degrees and therefore are cone-shaped

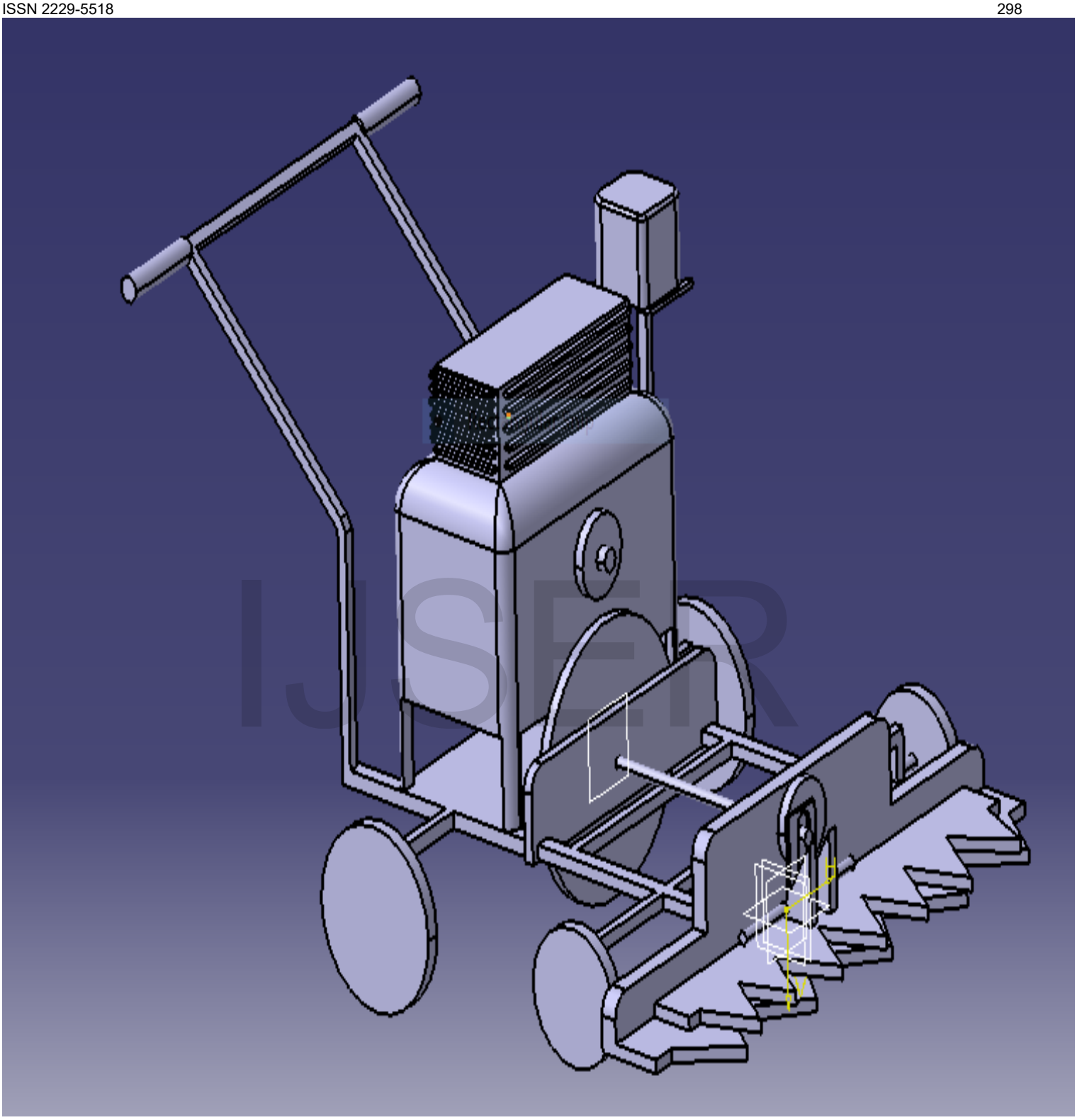
3 PROCEDURE FOR PAPER SUBMISSION

3.1 Final Stage

Reasonable paddy cutting machine has been designed and fabricated for the farmers.It is mainly applicable for the farmers who are have few acres of land .

3.2 Figures





4. EQUATIONS

Velocity of belt, $V = \pi * D * n_1/(60*1000)$

Equivalent pitch diameter, $d_e = d_p * F_b$

Assuming small diameter factor, $F_b = 1$

$N^* = V^*(0.79/V^{0.09} – 51.33/d_e – 1.31^*V^2/10^4)$

$\theta_s = 180 - \sin^{-1}((D-d)/(2^*C))$

Pitch length of the belt, $L = 2^*C + \pi^*(D+d)/2 + (D-d)^2/(2^*C)$

No. of belts, $i_b = (N/N^*)^*F_a/(F_c^*F_d)$

No. of belts, $i_b = (N/N^*)^*F_a/(F_c^*F_d)$

P = 2*π*N1*T1/60*103 T1=3.66*103 N-mm

T1 = π/16*fs*d1 3 Fs (Ind) =0.044 N/mm2< fs (perm) = 34 N/mm2

Centre distance of pulley = 2 (D1 + D2)

S = V = (π*D1*N1)/60000 = 3.76 m/s

Arc of contact (α) = 1800 –(D1-D2)/C * 600 = 1630 330 = 2.85 Radian

L=2*C+ π (D1+D2)/2+ (D1-D2)/4*c

N2 \ N1 = D1 \ D2

5.CONCLUSION :-

- This is machine used for harvesting and chopping onsite fodder collection.
- This machine will be helpful for small scale farmers.
- The machine is simple in construction as there is not so much complication in design.
- The machine is designed in such a way that it will require minimum space to install.
- The cutting blades can be easily detached by operator for sharpening purpose**.**

REFERENCES :-

[1] Design and Development of manually Operated Reaper, P.B.Chavan, D .K. Patil, D .S. Dhondge, IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN: 2278-1684,p-ISSN: 2320-334X, Volume 12, Issue 3 Ver. I (May. - Jun. 2015), PP152

[2] Design and analysis of crop cutter, R. A. Ghumadwar, MR. V. H. Bankar, International journal of pure and applied research in engineering and technology, ISSN: 2319-507X, 2016; Volume 4 (9): 242-246

[3] A Review: Design and Analysis of Arm of Reaper and Binder Machine, Tejaskumar Patel, Chetan Vora and Vipulkumar Rokad, International Journal for Scientific Research & Development, Vol. 4, Issue 01, 2016 | ISSN (online): 2321-0613

[4] Design and fabrication of crop reaper, Shalini P. Shivankar, Ashish. M. Wankhade, Mansur. N. Syed, International journal for engineering applications and Technology, ISSN: 2321-8134