Proposals for Improving the Process of Seed Distribution

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ABSTRACT   *The paper presents theoretical studies performed to adapt a universal drills for sowing of seeds for different sizes by improving their distribution process, changing the distributor groove.*
The paper presents the theoretical studies carried out in order inclination grooves with an angle to ensure movement of seeds after generator grooves, with unloading buckets by covering these.
The results also demonstrated that replacing the cylindrical shape with the shape prismoid form not significantly alter the volume of the grooves but ensure continuous and uniform discharge of seeds so increases the uniformity of distribution of seeds in the soil.
The paper also presents the opportunity of the distributor of two parts, namely the motor shaft in the metal material and distributor of plastic obtained by printing case study Rapid Prototyping.
About have demonstrated the ability to adjust flow and also made widely easy and quick and uniform distribution of seeds.

Introduction

Theoretical studies conducted in an attempt to provide a drill seeds of different sizes that can be used to establish the cultures in the nursery or light soils, in accordance with the uniformity of the sowing depth, keeping the seeding constant, the uniformity of the distribution of seed row [Sărăcin et al 2009].

In the literature it studied several times and in different ways opportunity to obtain reports of transmission of rotational movement to electricity distribution, as much in order to ensure a large number of small quantities distributed per unit area [] , also the founding crops on light soils studied adjusting the seeding (very small) and its constant maintenance of the adjustments or by using Coulter angle into the soil very low or even zero. [Sărăcin I et al.2010]. .

The main aim of this paper is to present the possibility of using existing universal seed drills for sowing small seeds, making some adjustments on their way:

- box seeds to be variable volume depending on the type of seed and sowing maximum amount calculated for them to surface Manufacturing unit made of plastic
- replacement distribution boxes fitted with spurs distributor cylinder type cylinder grooves inclined prismoidal form.
- placement drill in front of a device for regulating and maintaining working depth
- replacement transmission from wheel transportation Norton type gearbox, with power transmitted from the power through gearbox Pulse.

Material and Method

For the studies and tests using seeds and distributor box (shown in Figure 1), designed to equip small seed drill on light soils.

As a working method used literature on the overall number of gear ratios, the overall number of sowing calculations reffering to the box.drills seeds of instability norm seeds.

[Bădescu et al. 2003]:
$$q=q_1 \cdot q_2 \cdot q_3 \cdots\cdots q_i \cdots\cdots q_n \quad (1)$$
in which:

q is the number of reports transmitted by the group kinematics p_i;
p_n is the number of cinematic groups.
The total number of transmission ratios to be achieved by transmission car seeders corresponding number N drills rules made in terms of using various crops sowing machine, between the values of N_{min} and N_{max}.

Total sowing can be ordered ascending in a string of the form:
$N_{min} = N_1; N_2; N_3; N_4;\ldots .N_{k-l}; N_k;\ldots N_q = N_{max} \quad (2)$

so increasing of N / Δ between two adjacent sowing is constant.

The possibility of using universal seeder for sowing of seeds of different sizes is reduced because each type of seed depending on crop has its properties.

Thus the relief angle or the angle of the flow is different, as well as its surface (rough, smooth, with bristles, etc.).

For these reasons, the uniformity of the distribution is small, so a time between the seed and the amount of seed per unit area delivered. [ ],

To this end was studied distributor groove camera settings used in the construction of distribution of drills with mechanical distribution shown in the figure 1
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Fig. 1 - Distributor used in the construction of INMA drill

Distributor with inclined grooves and the dosing volume variable, L the length of the distributor, D – external diameter α- the angle of the grooves is based on the cone and ensures that the alignment of the seed distribution there of.

Seed box is provided with a mechanical stirrer placed in the bottom of the enclosure to help to supply continuous power distribution apparatus.

Calculations on the sowing box sowing machine must determine their optimal volume space Drills pathway between two consecutive feeds, orifice size flow of seeds etc.

These elements and their relationships are related to the rule of calculation of seed per hectare, the distance between seeds in a row, the sown area, working capacity of the machine etc., and monitored most Drills.

To calculate the quantity of seed using the following equation [3]: [Bădescu et al. 2003]:

$$q_m = \frac{\Sigma \dot{q}}{n} \ [g] \qquad (3)$$

Where: q_i - seed mass;
n number of distribution boxes.
Sowing instability constant speed was calculated with formula (4) [Bădescu et al. 2003]:

$$i = \frac{\sqrt{\frac{\Sigma(N_m - N_i)^2}{n}}}{N_m} \cdot 100 \ , [\%] \qquad (4)$$

In case of:
N_m - arithmetic average mass of three repetitions;
N_i - arithmetic average mass for each repetition;
n number of repetitions.

The amount of seed distributed to regulate the minimum flow, maximum flow rate and the flow rate typically on the scale on the gearbox without taking into account the characteristics of the seeds is shown in table 1.

Table 1
Adjustment possibilities seed flow

		Working speed / km/h			
		3.8	6.2	8	10
100	Maximum flow	534	515	515	508
65		344	341	340	323
60		307	306	305	295
55	Usual rate	276	273	The gradation on the gearbox	Flow characteristics
50		234	233	231	220
45		202	197	197	194
40		169	167	166	163
20	Minimum flow	13	13	13	12.7

To achieve those proposed to consider the possibility of replacing parts or removing them from construction drill follows:

- Agitators type fingers can be replaced with a mechanism of movement (vibration) box of seeds during work;

- Seed distribution apparatus can be made as groove cylinders with inclined channels made of plastic mounted in boxes from the same material; [Sărăcin, and Olimpia Pandia., 2010]

To achieve angled grooves and increased flow capacity of seed from the cavity formed between the fingers distributor proposed to amend the cup and using the prismatic form presented in figure 2.
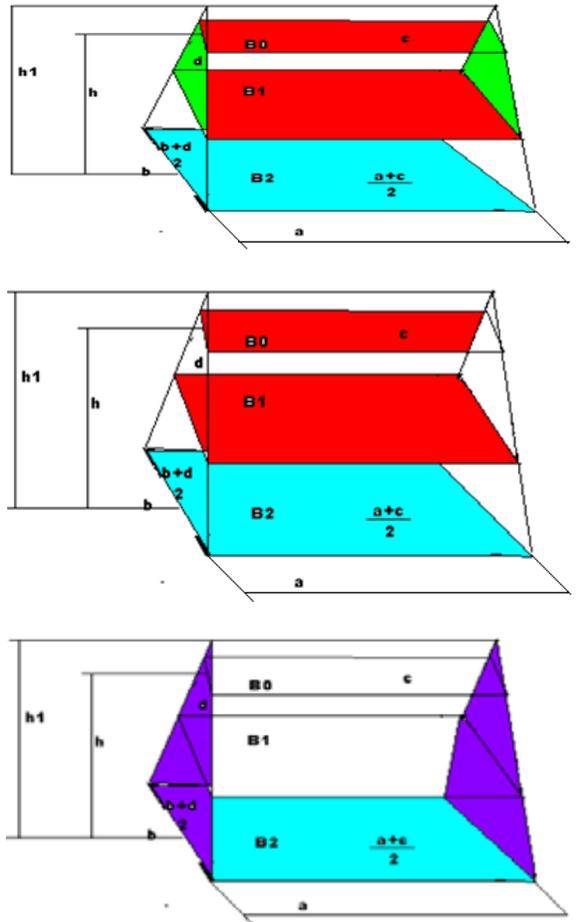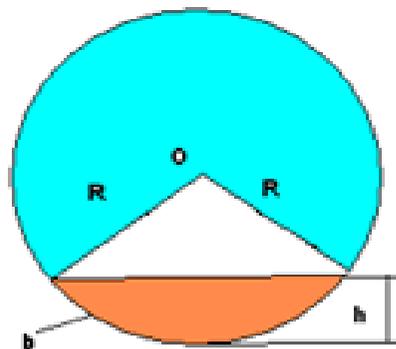

Fig. 2- Prismoid form proposed for achieving the distributor angled groove
To calculate the volume between the grooves Kepler's rule was used.

V = h[2(a·b+c·d)+a·d+bc]/6 / cm³ (5)
Where: V represents the volume and, a, b, c, d, h are measured and reported in figure 2.
To calculate the volume between the cylindrical grooves using figure 3.

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Fig.3 - Cylindrical grooves calculate the area using circular sector
A = 1/2b·r-1/2s(r-b) / cm² and , (6)
V=A·l / cm³ (7)
Wherein: A is the area of the circular sector

V - the cavity volume annular grooves

l - the length of grooves

s -rope is circular segment

$S = \alpha^0 / 360 - b \cdot r \cdot \pi r^2 / 2 / cm^2$ (8)

r, b, α are measurable values

$$A = \frac{1}{2}b \cdot r - \frac{1}{2}s(r-b) \ / cm^2$$

S is rope

h- circle height

$$s = \alpha^0/360 \pi r \cdot 2 \cdot \frac{br}{2}$$

$$S = \frac{120}{360}\pi r^2 \cdot \frac{br}{2}$$

$$S = 0.33 \cdot 3.14 r^2 + \frac{b \cdot r}{2}$$

For $\alpha = 120^0$ rezult S=8

b is bow

b:$\alpha^0 = 2\pi r : 360^0$

b=$2\pi r 360^0/$

α=120^0

b=18.9mm

h= 4mm

r=5

s=8mm^2

A=0.103cm^2

v=0.103·3=0.309cm^3

v is volume between grooves

Conclusions

- Following the theoretical calculations revealed that circular respectively cavities prismoidal form volume is approximately equal, the difference is very small.
- Downloading seeds of cavity prismoidal form slanted walls is continuing against the circular wall that is grouped.
- seed flow is influenced by the flat shape of the cavity walls and the angle of inclination.
- Operation requires no additional training drill.
- We recommend using plastic dispenser manufacturing method thereof Rapid Prototyping with the possibility sectioning in two removable parts that allow quick replacement thereof depending on the size of the seed.
- It is also recommended creating a system that allows driving sleeve which limits the drive shaft movement instead of seeds that can be mounted distributor.
- Move sleeve covering the grooves to be achieved by driving a screw mechanism and gradually sector.

REFERENCE

[1].Bădescu M.,Tudor A.,Glodeanu M.,Sărăcin I.(2003)-Mașini agricole,Publisher Universitaria Craiova [2]. Sărăcin I., G. Marin, P. Olimpia, Florea G. (2009) - Energy basis for agriculture, horticulture, forestry, Publisher Aius Printed - Craiova; [3]. Saracin I. Olimpia Pandia., Netoiu Constantin., 2010 - Theoretical study of Achieving seeders for forestry nurseries of resinous, Annals of the University of Craiova - Agriculture, Montanology, Cadastre Series, Vol. XL / 2, p. 556-560; [4]. Sărăcin I. Olimpia Pandia., 2010 - Sowing for small seeds, Annals of the University of Craiova - Agriculture, Montanology, Cadastre Series, Vol. XL / 2, pp. 561-565; [5]. Sărăcin I. 2002 -2004 - Universal easy drill for sandy soils, Contract NURC, no. 33451, Contract manager, University of Craiova; ***Technical documentation Bucharest National Institute for Agricultural Mechanization(INMA)