RESEARCH RELATED TO THE FINISHING WORKS OF THE DRILLED CYLINDER AT THE HAMMER CRUSHING DEVICE USING REAMING METAL RULER AND KNIVES FOR LATHING

Iancu Carmen Violeta, Popovici Mariana

*University of Oradea, Faculty of Environmental Protection, 26 Gen. Magheru St., 410048 Oradea, Romania, e-mail: ciancu@uoradea.ro

Abstract

The current work presents a method of the finishing work of the crushing's devive holes as well as the adjustment of the crushing device using reaming metal rulers and using knives for lathing. The new construction of the reaming metal rulers with a double eccentric is simple and easy to realize successfully replacing the reaming ends with an eccentric manual induction.

Key words: hammer crushing device, finishing, drilled cylinder holes, reaming metal rulers

INTRODUCTION

The crushing devices are largely used to mince alimentary raw materials (cereals, malt, sugar, fruits). The operation of crushing consists in repeated hits of the working organs (steel hammers) into the product which is meant to be crushed, hitting the particles of the crumbled product against the walls of the crushing device and rubbing them on the surface of the drilled pad. (Amarfi, R., Brad Segal 1948,et, Ioancea, L., Petculescu, E. 1995,)

The technological efficiency of the hammer crushing device is characterized through the product's degree of crushing, through the productivity and specific energy consumption for 1 ton of crumbled raw material. The efficiency of the hammer crushing device depends on the physical characteristics of the processed raw material (humidity, hardness).(Răşenescu I 1972, 1987, Stănciulescu 1975, Gh., . Banu, C., ş.a, Gheorghiță, M 1997)

In order to realize the crushing of the product right in the moment of hitting it, the peripheral speed of the hammers' ends must be pretty high. (Balc, G.2000, . G. Ganea, 2007, Şlepeanu, I., ş.a 1959, Banu, C, ş a 1993)

The value of this speed can be determined from the reaction which expresses the law of the movement quantity:

$$m(v_2 - v_1) = F \cdot \tau \qquad (1)$$

In which:

m – is the mass of the particle in kg

v1 v2 – the speed of the particle, until its hitting against the hammer and after the hitting, in m/s

F – the force of the hit necessary for the primary crush of the particle, N;

τ- the duration of the hit (can be accepted as being equal with 1-10-5 s).

As v1 is much more lower than v_2, it can be accepted that:

mv2 = Fτ (2)

As it can be noticed v_2 is equal with the peripheral speed of the hammer. From here it comes out that:

$$v_2 = \frac{F \cdot \tau}{m} \quad (3)$$

Depending on the place where the working organ is situated (the hammer impeller) there are crushing devices with horizontal hammers and with vertical hammers.

From the construction point of view the crushing devices are analogical. They only differ by the fact that at the vertical machines the hammers are rigidly fixed and the drilled cylinder occupies the entire surface of the working space while at the horizontal crushing devices the hammers are jointed through bolts and they can freely rotate around their own axes and the drilled cylinder can occupy only the inferior part of the working room through which the crumbled mass is evacuated.(**.** Gherman, V, 1997)

The crushing device presented in figure 1 is made up by the case which is fixed on the electric engine flange through the division room. The impeller is fixed inside the case on the engine's electric tree and on the impeller the counter hitter is fixed (drilled cylinder) and of pending hammers jointed through bolts. The case closes with a lid on which the alimentation bunker and a metal chicane are installed.

Depending on the quality of the initial raw material, the product's mincing degree can be established by adjusting the working dimensions of the drilled cylinder's holes.

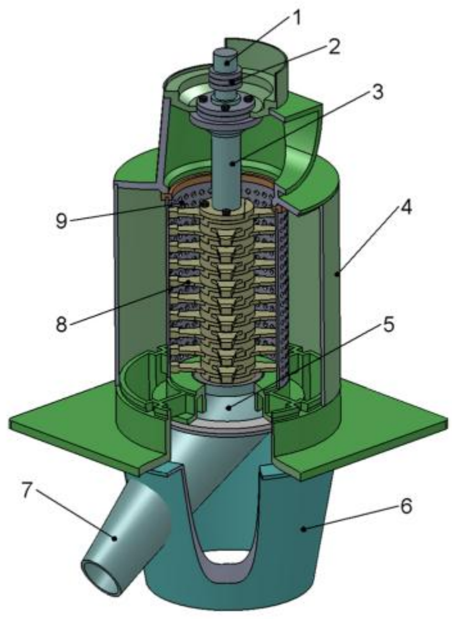

Fig. I .The vertical crushing device with hammers
1 – the electric engine treei; 2 - coupling; 3 –vertical tree with hammers; 4 – case; 5 – drilled pad; 6 – evacuation funnel; 7 - connection; 8 - hammers; 9 – drilled cylinder.

MATERIAL AND METHOD

The reaming bar with double eccentric for the finishing work of the holes by lathing with knives for interior lathing made from a cylindrical reduction presented in figure2.

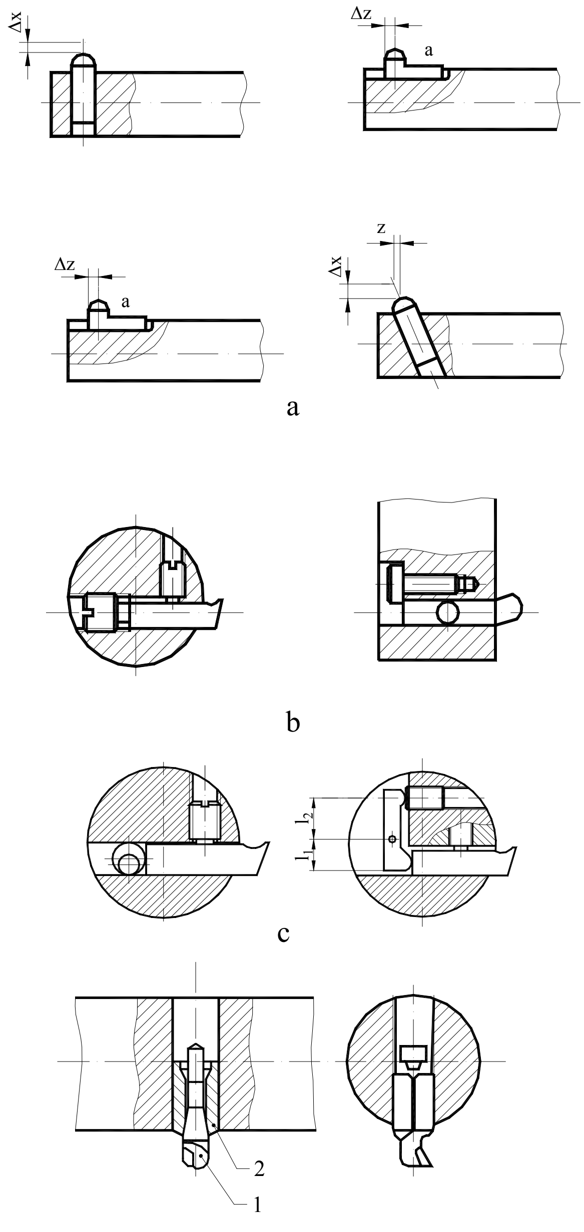

Fig 2. a, b, c, d Usual constructions of reaming metal rulers with knives for small reams and holes.

Having a cylindrical support presented in figure 3 (Klințov, I.G., Kaderov, 1973,)

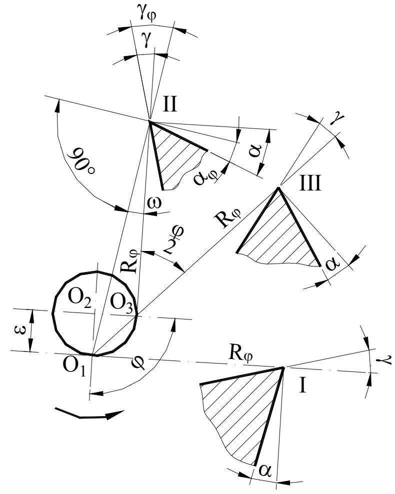

Fig.3. Scheme of knive adjustment in a mount with eccentric

Having an eccentric mount presented in figure 4 an an interior knife with a cylindrical tail with fixation and non figured known positioning elements, it is characterized by:

1) a knife for interior lathing is fixed in the eccentric fitting so that the axis coincides with the main axis of the machine/device (the fitting axis) ”O1”, in this case the cutting part of the knife occupying position I (Fig 3);

2) the eccentric fitting is made up of a body, an eccentric axle-box, an axle-box to clamp the device, clamping screws (Fig 4); (Klințov, I.G., Kaderov, 1973,)

3) The eccentric axle-box and the centering axle-box have got circular scales, which the moment the knife is fixed coincide with the 0 position on the body of the fitting, the reaming diameter being equal with two times the radius of the knife.

4) in case of the eccentric fitting the eccentric axle-box is fixed in such a way that its O2 axis is deviated in comparison with the fitting axis, with a known „ε” value of eccentricity; (Klințov, I.G., Kaderov, 1973,)

5) the axle-box for centering and fixing the lathing knife is fixed in the eccentric axle-box so that its axis be at the same „ε” distance in comparison with the rotation axis of the eccentric axle-box;

6) the exterior diameters of the eccentric fitting's body, of the eccentric axle-box and of the centering and fixation axle-box of the knife are equal.

7) on the cylindrical surfaces of the two axle-boxes a division scale is performed so that on the eccentric axle-box the values of the division increase from the landmark that indicates the 0 position towards the direction of the clock needles' rotation and viceversa on the centering and fixation axle-box of the knife.

8) the sclae of the centering and fixation axle-box of the device has divisions two times lower than the divisions on the eccentric axle-box, the value of the divisions being of 0,01 mm on both axle-boxes.

9) on the exterior surface of the axle-boxes there are arrows which indicate the rotation direction necessary to adjust the knife to the appropriate dimension. (Klințov, I.G., Kaderov, 1973,)

10) on the frontal surface of the axle-box for the adjustment and fixation of the knife the 0 position is marked by a landmark which corresponds to the initial position of the cutting part of the knife, this landmark being situated at an angle of 900 towards the materialized radial plan through the 0 landmark coincidence from the engine's body and from the 2 axle-boxes.

The presented construction's novelty aspect consists in a new form of the mandrel with eccentric for milling adapted to the reaming metal rulers as well as in its new usage for the work of finishing the holes.

RESULTS AND DISSCUSIONS

The problem studied in the current work is the work of finishing the holes of the drilled cylinder from the hammer crusher, using reaming metal rulers with double eccentric and knives for interior lathing.

When finishing the holes different other types of reaming metal rulers are used with radial adjustment knives or knives axial to quota, presented in the special literature, with the fitting of the knife composed from elements of fixation and orientation whose dimensions cannot cover all the diameter range.

In the current work we have presented a more advanced method to finish the holes of the drilled cylinder using a new heterogeneous construction of a reaming metal ruler with an eccentric fitting of the interior lathing knives for small diameters capable to get rid of many disadvantages.

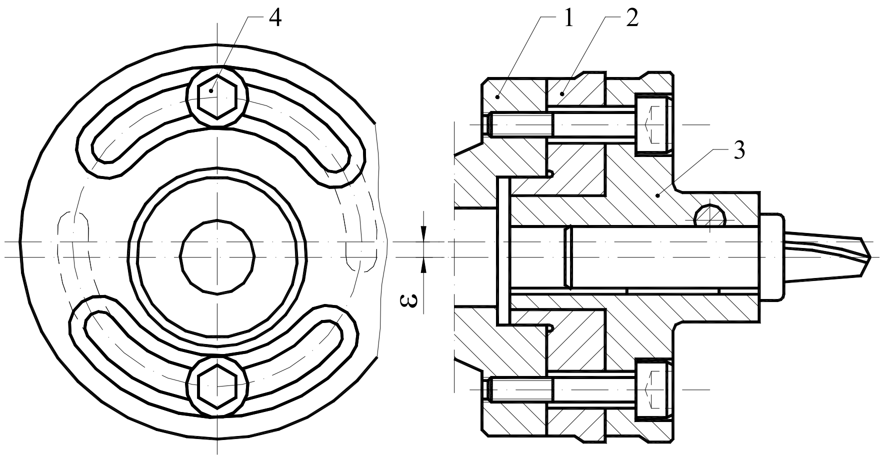

Fig.4. Fitting with eccentric:
1- body; 2- eccentric axle-box; 3- axle-box for centering and tightening of the device; 4- clamping screws.
2-

CONCLUSIONS

The construction of the reaming metal rulers with eccentric is robust, with a low gauge easy to build.

The use of reaming metal rulers with eccentric for the work of finishing holes with the help of cylindrical body lathing knives for the interior allows their resharpening many times, their durability having risen 5-10 times.

By introducing the double eccentric fitting in the dimension chain of the reaming metal rulers, in order to fix to the lathing knife to a quota, the knife is situated symmetrically to the axis of the supporting body, so that the difference between the constructive and technological angles arising through the placement of the knife depend on the hole's diameter, the dimensions of the section and the fixation angle, the effective kinematic angles being determined by the super elevation of the cutting part of the knife.

REFERENCES

1. Amarfi, R., Brad Segal, V. Cubleşan, G. Dima, Utilajul tehnologic din industria de prelucrare a produselor horticole, Editura Ceres, Bucureşti 1948

2. Balc, G., Calculul şi construcţia utilajelor pentru industria alimentară, Editura Todesco, Cluj-Napoca, 2000

3. Banu, C, ş a., Progrese tehnice, tehnologice şi ştiinţifice, vol.2, Editura Tehnică, Bucureşti, 1993

4. Banu, C., s.a., Manualul inginerului de industrie alimentară, vol. I, II, Editura Tehnica, Bucuresti, 1999.

5. Banu, C., ş.a., – Manualul inginerului de industria alimentară, vol. I, Editura Tehnică, Bucureşti, 1998

6. Gheorghiţă, M.,– Tehnologii, procedee şi utilaje în industria vinicolă, Universitatea din Craiova, 1997

7. Gherman, V., Utilaje pentru industria alimentară, Editura Sincron, Cluj-Napoca, 1997.

8. G. Ganea, G. Gorea, D. Cojoc, M. Bernic, Utilaj tehnologic în industria alimentară, Editura Tehnica – Info, Chişinău, 2007 .

9. Ioancea, I., ş.a., – Maşini , utilaje şi instalaţii în industria alimentară, Editura Ceres, Bucureşti, 1986.

10. Ioancea, L., Petculescu, E., – Utilajul şi tehnologia meseriei, Editura Didactică şi Pedagogică R. A., Bucureşti, 1995.

11.Iones cu D., ş.a. – Pregătire de bază în industria alimentară, Editura Niculescu, 2004

12. Klinţov, I.G., Kaderov, V.D., Frezarea canalelor precise cu ajutorul mandrinelor cu excentric, Vestnik Maşinastraenia nr. 3/ 1973, p.58-59. cz.621.914-45.

13.Moţoc, V., Răşenescu I., ş.a., – Manualul inginerului din industria alimentară, Editura Tehnică, Bucureşti, 1968

14. Muscă, M., – Tehnologia generală a industriei alimentare, Universitatea din Galaţi, 1984

15. Răşenescu I, Operaţii şi Utilaje în Industria Alimentară, Editura Tehnică, Bucureşti, 1972, Vol I şi II.

16. Răşenescu I., – Operaţii şi utilaje în industria alimentară, vol. I, II, Editura Tehnică, Bucureşti, 1972.

17. Răşenescu, I., Oţel, I., – Îndrumar pentru industria alimentară, vol. I, II, Editura Tehnică, Bucureşti, 1987

18. Stănciulescu, Gh., – Tehnologia distilatelor alcoolice din fructe şi vin, Editura Ceres, Bucureşti, 1975

19. Şlepeanu, I., ş.a.,– Maşini şi instalaţii folosite în vinificaţie, Editura Agrosilvică, Bucureşti, 1959

20. STAS 12066 - 82