UDC 621.86.067

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SYSTEM FOR REMOVEL OF CHOCKING-UP OF FREE-FLOWING MATERIALS IN RECEIVING HOPPERS

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Different methods and devices which apply for the removal of hangings-up of free-flowing materials in receiving hoppers are considered and also for cleaning of technological equipment. A device, allowing to provide not only the even exit of materials from hoppers but also continuity of technological process, is offered.

Keywords: receiving hopper, free-flowing material, hangings-up of material, devices for its break down, apparatus «Bump»

Introduction. The fair quantity of technological operations in ferrous and coloured metallurgy is related to processing, transporting and storage of different friable materials in receiving hoppers. Mobility of friable material which is in middle and especially overhead areas of this hopper is an insignificant, therefore this area is the mestome of the most credible origin of hangings up.

In case of occurring of hangings up of mass of friable materials, being in a receiving hopper, above its unloading opening a durable arch from the mentioned materials, which hinders to their out of low from an apparatus, appears. For warning of hangings up it is necessary to start going the system of bringing down, set on a hopper.

Analysis of achievement and publications. The different methods of the pneumatic bringing down of friable materials are known in receiving hoppers. So, in work [3] the method of the pneumatic bringing down of friable materials in hopper is described by the turn serve of air impulses in the rows of nozzles, located in the walls of hopper, when an air impulse is given in a hopper simultaneously through nozzles, located in one vertical row, and alternation of air impulses is produced consistently on the perimeter of hopper. In the article [6] the results of industrial exploitation of the systems of the impulsive pneumatic bringing down of friable materials on a base air-guns «ISTRA-4» are presented. By the lacks of the above-described methods and devices for pneumatic destruction of hangings up and bridging of friable materials in receiving hoppers are localization of their action, and also increase of humidity of friable materials in the places of air outlet. In addition, the mentioned methods and devices require the great number of additional operations for preparation and treatment of air, and such equipment is expensive, that results in the increase of power inputs on the conduct of process.

A device for bringing down of arch from friable material in hoppers [7] is known, which contains an inductor, located in cup with a lid above a firing-pin which is connected with a transforming and accumulative block and source of voltage and

envisaged on the wall of hopper. Cup with a lid and firing-pin is executed from soft magnetic material, on the axis of cup is located core one end of which is hardly connected with a firing-pin and on the second end of core a spring is envisaged. The lack of the known device it is been direct operating of firing-pin on the walls of hopper, small efficiency of action of the electromagnetic fields from their considerable dispersion in radial direction, and also subzero efficiency.

Raising of task. To work out the device of electro-impulsive destruction of hangings up of friable material in receiving hoppers.

Basic part. By the workers of OAO the scientific and industry enterprise «EMIS» was worked out apparatus «Blow» [8], which consists of shock mechanism of bringing down of friable materials, mobile stub-sheet, and also story-regulative block with a control panel.

At unloading of receiving hopper in the case when there is bridging and sticking on its walls of friable material, that results in stopping of serve of material, from the electric system a feed is tricked into to the transforming and accumulative block, with a subsequent serve of charge on the working spools of inductor, as a result the meeting concentrated electromagnetic streams which silk to move apart them are created in their coils. Force which pushes a firing-pin in cup toward a metallic sheet and carries out its blow to the sheet increases additionally. The action of mechanical impulse on the surface of sheet creates in it the progressing wave of resilient deformation which destroys adhesion between hanging up material and metallic sheet. As a result, there is destruction of arch of friable material and its free pouring out from a hopper on conveyers.

In addition, springs which are set on a cup compress the spools of inductor and provide their dense adjoining to each other, and also push-to-resetting after their divergence. The second spring which is located in a firing-pin provides its free position in relation to a cup, diminishes operating of flexion moment on a cup at the blow of firing-pin on a sheet, and also increases motion of firing-pin.

The use of vibro-sheet eliminates the direct affecting of firing-pin wall of hopper, increases tenure of its employment and promotes efficiency of bringing down, because unlike the wall of hopper a vibro-sheet does not have ribs of inflexibility and is more flexible, less hard and the wave of resilient deformation passes easily on all its surface. The presence of rubstrip between a metallic vibro-sheet and hopper is damped by the transfer of vibrations from a vibro-sheet on the wall of hopper during a blow to it. A protective belt and rubstrip hinder to penetration of friable material under a vibro-sheet.

The flexible tuning of intervals and power of impulses, depending on physical properties of friable material, allows to attain the maximally effective removal of sticking. Due to a short impulsive blow (0.001 s) the mechanical damage of technological equipment and weld-fabricated seams of construction of hopper is shut out.

The worked out system of bringing down of hangings up of friable material is inculcated in the story hoppers of baghoses of sintering plant of PAJ «Metallurgical combine «Zaporozhstal′», on OAJ the «Mykolaiv aluminous plant», PAJ «Arselor Metal» (Cryvoy Rog, Poltava ODP and row of other enterprises of Ukraine. Practice of exploitation of the mentioned system testifies to high efficiency of this method for

removal of hangings up of friable material in receiving hoppers and cleaning of industrial equipment.

Conclusions. The critical analysis of existent devices for the removal of hangings up of friable material in receiving hoppers and systems of cleaning of industrial equipment is executed. A device, allowing to provide the even exit of friable material from hoppers on conveyers and continuity of technological process, is offered.

REFERENCES

1. **Мисенев, С. И.** Опыт внедрения систем пневмообрушения на базе устройств «ИСТРА-4» в бункерах сырого сланца [Текст] / С. И. Мисенев, А. З. Сийрде, С. В. Юркин, В. В. Якутов // Электрические станции. – 2012. – № 11. – С. 52-55.
2. **Пат. 15289 Україна**, **МПК B 65 G 65/30.** Пристрій для обвалення склепіння з матеріалу в бункерах / С. П. Коверник, І. С. Компанєйщиков. № u200600228. Заявл. 10.01.2006, опубл. 15.06.2006. Бюл. № 6.
3. **Пат. 111072 Україна**, **МПК B 65 G 65/30.** Пристрій обвалення склепіння з матеріалу в бункері / І. С. Компанєйщиков, С. П. Коверник, Я. І. Богданов, Є. І. Нестеренко. № u201605585. Заявл. 23.06.2016, опубл. 25.10.2016. Бюл. № 20.