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E. PODSZUS

ROUNDING OF METALLIC POWDER PARTICLES

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Fig. 1.

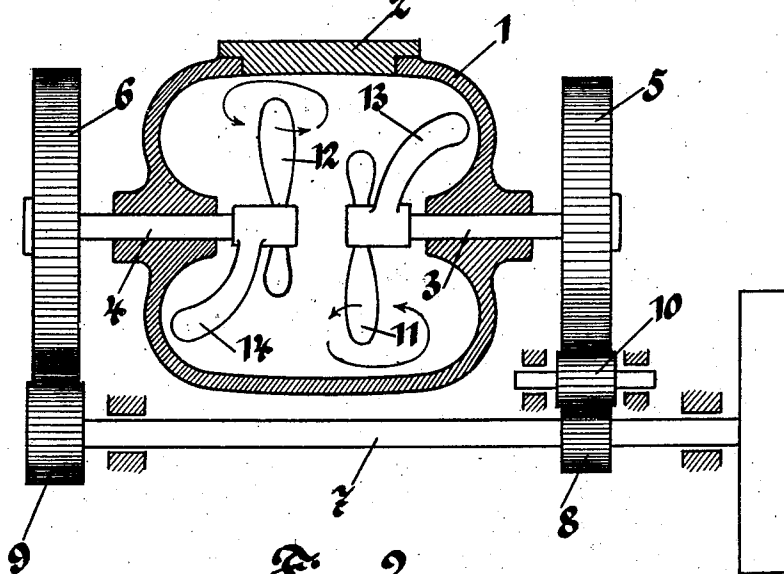
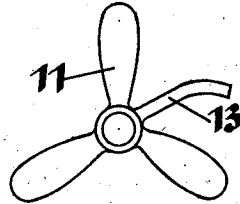


Fig. 2.



Inventor:
Emil Podszus
By *Alfred*
Att'y.

UNITED STATES PATENT OFFICE.

EMIL PODSZUS, OF BERLIN-FRIEDRICHSHAGEN, GERMANY, ASSIGNOR TO HARTSTOFF-METALL AKTIENGESSELLSCHAFT (HAMETAG), OF BERLIN-COPENICK, GERMANY.

ROUNDING OF METALLIC-POWDER PARTICLES.

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This invention relates to process and devices for the rounding of metallic powder particles.

For many uses to which metallic powder is put, it is desirable to have the individual particles of the powder, however, fine or small they may be, as round or spherical as possible. The present invention relates to processes and devices for converting powder particles that have sharp, jagged or tattered edges into round particles. To this end the powder to be dealt with is placed in a closed casing that prevents the particles from evading the treatment which they are to undergo. The casing must be filled with powder to such an extent that its particles cannot evade each other in the rounding process to which they are to be subjected. This process consists in exerting a pressure on the particles and causing them to rub against each other. The rounding of the particles is brought about partly by altering their shape by external pressure and partly by the rubbing off etc. of the projecting edges of the same.

The process is brought about by forcing a quantity of the powder particles dealt with to move. As these particles are prevented by the closed casing that contains them from deviating laterally from their course, friction must necessarily arise between the particles of the powder and their motion must also result in pressure being exerted on the powder.

As a single rubbing and pressing operation would not be sufficient to accomplish a complete rounding of the particles and to deal with all the particles in the powder, the process is arranged so that all the particles of the powder circulate in the casing and the said operation is repeated again and again. In these operations the powder particles are continually remixed and after a few hours, or a longer period if the properties of the powder require it, all the particles will have the desired roundness or sphericity of shape.

Pressure and motion is imparted to the powder particles by twisted vanes, blades, screw propellers or the like which are moved positively in the casing. To make the particles mix as intimately as possible and thereby subject all of them to the rounding treatment a plurality of the said moving members are preferably employed and they are made different in shape, size and speed.

These moving members cause a positive pushing of the particles through the material in the casing, and compel the powder particles to press and rub against each other, the amount of particles within the closed casing being sufficient to prevent free passage during movement; the particles thus exert pressure on each other and become rounded due to the mutual grinding action.

The novel process is particularly effective when a number of blades, screw propellers or the like are provided which are curved or made to act in opposite directions so that the powder particles are urged from opposite directions into the space between the blades and then against the walls of the casing.

The invention is illustrated in the drawing in which

Fig. 1 is a diagrammatic vertical section of a device for carrying out the afore-described process and

Fig. 2 is an end view of a moving member or propeller that sets the metallic powder in motion.

The device consists of a casing 1 to the interior of which access can be had through an opening that is closed by a lid 2. Journalled in the casing are two shafts 3 and 4 the inner ends of which carry powder moving members such as screw propellers 11 and 12 each provided with a plurality of blades (three in the type illustrated) and a rearwardly bent arm 13 and 14 respectively that reaches into the annular lateral recesses of the interior of the casing. The shafts 3 and 4 have cogwheels 5 and 6 on their external ends and the motion of a common shaft 7 is transferred through pinion 9 directly to the cogwheel 6 and through pinions 8 and 10 indirectly to the cogwheel 5 so that the shafts 3 and 4 and their propellers rotate in opposite directions. When the propellers or vanes 11 and 12 rotate their screw motion causes the masses of powder in their neighbourhood to be pressed against each other so that they rub against each other and move back into the space at the rear of the propellers whence they are again moved forward so that they travel continuously in a curved path or cycle substantially as indicated by the arrow. The arms 13 and 14 assist the powder to act in this way, because they have the form of rearwardly extending blades or shovels that seize the powder in the lateral recesses of the cas-

ing and rotate it while urging it towards the middle space between the propellers, so that the entire contents of the casing are forced to undergo the process by which the powder particles are rounded.

During this process the particles are pressed against each other, against the propeller blades and partly also against the walls of the casing. At the same time the powder particles are caused to move with respect to, each other and to rub against one another.

The quantity of powder put into the casing is such that the whole, or a considerable part, of the propeller blades are covered with powder. On account of the great resistance that the blades have to overcome and to obviate a whirling up of the powder particles the speed of revolution should not be too rapid.

In the type of device illustrated the propellers are driven at different speeds of revolution so that they keep on seizing different masses of the powder. The entire powder is kept continually in motion. Although a specific form of propeller is shown the members for pressing and shifting the powder may be constructed in many other ways.

By this novel process it is possible to convert irregularly shaped metal powder particles into approximately round bodies in a few hours and when the process is carried on for longer periods the space occupied by tough ingot-iron powder per unit of weight is reduced, due to the rounding of its particles, to about 50% of the space taken up before application of the rounding process. In specific cases the exact figure will of course depend upon the size of the powder particles and the nature of the metal of which they are composed.

Generally the metal powder treated in accordance with the novel process will preferably be dealt with in a dry condition, but small quantities of liquid, say a few per cent, may be added provided that the liquid used does not tend to cause the particles to bind with each other or to make them plastic. By thus adding liquid the friction in the powder is reduced to a certain extent and the displacement of the powder particles is thereby rendered easier. A liquid that might be used is oil, for example, or organic liquids.

I claim:—

1. The method of rounding metallic powder particles which comprises subjecting the mass of particles to a pressing and rubbing action and positively pushing said particles repeatedly through the mass while being pressed and rubbed.

2. Apparatus for rounding metallic powder particles comprising a casing for holding the particles, means within the casing for imparting motion to the particles and forcing them to rub and press against each other, and means in the casing for positively pushing said particles repeatedly through the mass while being pressed and rubbed.

3. Apparatus for rounding metallic powder particles comprising a casing for holding a mass of the particles, said casing having lateral recesses, means within the casing for subjecting said particles to a rubbing and pressing action, and means for positively pushing the particles in said recesses toward the zone of action of said first mentioned means whereby to subject the particles to repeated rubbing and pressing.

4. Apparatus for rounding metallic powder particles comprising a casing for holding a mass of particles, said casing having lateral recesses, rotative members within said casing for imparting motion to said particles and forcing them to rub and press against each other, and rotative arms extending into said recesses and operative to positively push the particles repeatedly through the mass.

5. Apparatus for rounding metallic powder particles comprising a casing for holding a mass of particles, rotative means in said casing for forcing said particles to rub and press against each other, and rotative means for positively pushing said particles repeatedly through the mass while being pressed and rubbed.

6. Apparatus for rounding metallic powder particles comprising a casing for holding a mass of the particles, said casing having lateral recesses, rotative shafts extending into said casing, propellers rotated by said shafts and operable to force the particles to rub and press against each other, and arms extending into said recesses and rotated by said shafts to positively push the particles in said recesses to mix through the mass.

In testimony whereof I have affixed my signature.

EMIL PODSZUS.