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PROCESS FOR PRODUCING LAMELLIFORM METAL POWDERS

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Fig. 1.

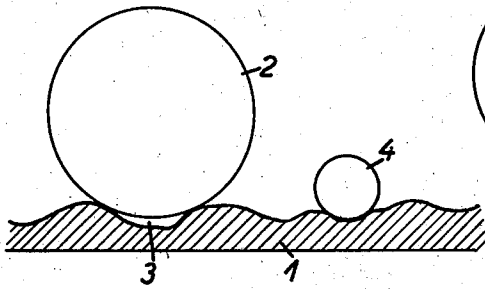


Fig. 2.

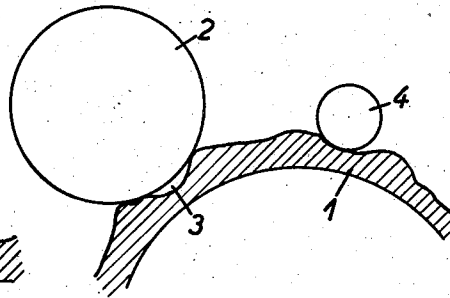
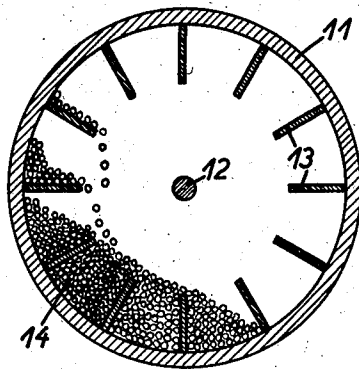


Fig. 3.



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PROCESS FOR PRODUCING LAMELLIFORM METAL POWDERS

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My invention relates to a process and device for converting fine metal particles into minute leaves, preferably such having a bright lustre as required in the manufacture of so-called bronze paints.

The various attempts heretofore made to flatten fine metal particles, as for instance by means of rollers, have not been successful.

The cause of such failure was, in the first place, due to the insufficiency of the means employed, in view of the extreme fineness of the powder, the size of the grain amounting, for instance, to one thousandth part of a millimetre.

According to my invention one can flatten and polish even very fine metal powder and at the same time produce a lustre on the surface of the flat metal particles.

This I achieve by so constructing the apparatus for flattening the metal particles that a sufficiently close contact between the working surfaces of the operating elements takes place to produce the desired success.

Of further importance is the quantity of the metal powder supplied in proportion to the size and dimensions of the operating surfaces of the apparatus.

If an excessively large quantity is fed into the apparatus, the metal particles are heaped on top of each other thereby forming, so to say, an elastic cushion which more or less prevents the flattening process. The best result is obtained, if the operating elements are covered with rather a thin layer of particles only and more preferably only with a layer of particles on the effective surfaces.

Furthermore the period during which the flattening operation takes place greatly affects the quality of the product.

Because of the accuracy required of the operating elements and the great cost entailed thereby, it seemed desirable, of course, to reduce their number as much as possible and in consequence thereof, to allow the metal particles to be subjected for a longer period to the action thereof, on the assumption that during such extended period a flattening of all particles could be effected.

Experiments have proved, however, that such a method does not produce a good result.

Moreover, the product will be a powder, a portion of which has not been flattened at all, while another portion has become compacted into large lumps, and that a small proportion only has received the desired flattened shape.

To prevent a compacting of the metal particles, the pressure between the operating elements must be suited to the hardness or toughness of the metal particles to be treated. It is therefore preferable to provide the operating elements with the greatest possible surface, in order to shorten the period of the working process, which, however, involves the disadvantage that the apparatus must be made of a considerable size.

According to my invention, however, this latter disadvantage is avoided in a simple manner.

In the drawing, the diagrammatic Figures 1 and 2 fully explain the above mentioned conditions with regard to the shape of the operating elements, while Figure 3 shows, by way of example, an embodiment of apparatus for carrying out the new process.

Figure 1 illustrates the mode of action of a device, where in one instance the proportions in the size of the various parts are not in harmony with each other due to deficiencies in manufacture, while in the other instance a correct co-operation between the operating elements is achieved.

Even tho the working faces of the operating elements have been prepared as carefully as possible, certain inaccuracies cannot be avoided. Generally, it may be said that already a great accuracy in the manufacture has been reached where the device approaches within one hundredth of a millimetre the mathematically correct shape, that is to say, the inaccuracies are below the limit of one hundredth of a millimetre and may therefore amount to nine thousandth of a millimetre, that is to say, nine grains of the size of one thousandth of a millimetre can slip by simultaneously without having been acted upon by the operating elements. If by chance such an unevenness comes to be opposite a similar inaccuracy of the co-operating element, naturally the double quantity of particles can slip

through the opening thus enlarged without being gripped by the elements. The larger the surfaces of the opposed working elements, the greater will be this danger. It is therefore advisable in order to avoid the disadvantage accompanying these inaccuracies, to make the working elements as far as possible of such a shape that mathematically speaking they touch each other along one line or, still better, in one point only. The first condition occurs, for instance, where a roller cooperates with a plane or curved surface, while the latter condition is present, where instead of a roller a ball is employed. This expedient will however not give the desired result, unless the ratios of the sizes of these elements are of the right proportion. In the diagrammatic Figure 1, 1 denotes a plate the inaccuracies of which have been exaggerated. If on this plate a roller or ball 2 of the size shown is allowed to roll, it is inevitable that between the roller or ball and the recesses in the plate 1, for instance in the position as shown, a hollow space 3 will be formed in which the metal particles to be flattened are wholly or partially out of reach of the roller or ball 2.

When looked at mathematically, this is due to the fact that the radius of curvature of the roller or ball 2 is greater than that of the unevenness in the surface of the plate 1. The unfavourable effect is still further increased, if corresponding inaccuracies also exist in the roller or ball 2.

Therefore, I make the radius of curvature of the roller or ball correspondingly smaller as indicated at 4. The formation of inactive hollow spaces 3 is thereby avoided and the metal particles can be acted upon in the desired manner.

The conditions are of course, quite similar if also the element 1, as shown in Figure 2, is given a curved surface.

In accordance with my invention, also elastic operating elements may be used adapted to be compressed so that no holes are formed by the cooperating surfaces. Since only comparatively slight inaccuracies are to be considered, a slight degree of elasticity of the working faces of the operating elements will suffice, or one of the elements only is made rigid, while the other is made elastic. The operating elements may, for instance, be made of fairly hard rubber, or of hard rubber, galalithe or the like. For obtaining a sufficiently hard surface one preferably gives it a coating of a hard material, e. g. electrolytically deposited iron which need be of such thickness only that it has the required degree of elasticity.

Either by the dropping of a weight or by the action of a spring, the proper pressure between the elements effecting the flattening is produced.

According to the size of the apparatus and the exactness of its manufacture the sizes of the various elements are best determined by experiments.

Also the quantity of the metal particles to be treated is best determined by experiments.

It is of importance that no great amount of metal particles accumulates between the working faces, because otherwise the flattening process is hindered. To cause fresh particles to pass between the working elements, I accomplish in a particularly simple manner by whirling up the particles of powder in an atmosphere of gas, powder or liquid with which the apparatus is completely or partly filled. The process is particularly successful, if the particles subjected to the operating elements are immediately whirled up, while the descending particles are worked.

A very good result is obtained, if the metal particles are not only rolled, beaten or hammered, but simultaneously also a sliding movement between the working elements takes place. In this way, the surface of the metal particles is polished and an increased lustre is obtained. With my process, it is of advantage depending on the condition of the metal powder to be worked, to add thereto small quantities of fat, oil and the like, as thereby the polishing process is aided and the danger of a caking of the particles is reduced.

At any rate, an injurious rubbing between the metal particles or between the metal particles and the operating elements must be avoided, as such rubbing would lead to an excessive disintegration of the metal particles which would tend to result in a blackening of the powder.

It must further be avoided that between the elements used for flattening no injurious rubbing takes place which will cause a wearing away of the working elements and a consequent contamination of the powder.

For the flattening there may be used according to my invention devices with which, for instance, a number of small hammers or the like are employed which are pressed against the co-operating surface by their own weight or by means of springs and which are movably mounted in a suitable manner.

A simple and efficient apparatus for practising the process is shown diagrammatically in Figure 3.

It consists of a drum 11 rotatably mounted on an axle 12. This drum 11 is fitted with a series of partition walls 13 which partly extend inwardly, preferably in the direction towards the axle 12. This drum is charged with the suitable quantity of metal particles to be flattened and with the correct number of steel balls 14 of the right diameter. The drum is then rotated about the axle 12.

The quantity of the powder and of the steel balls required is preferably fixed by experiments. At any rate, only a part of the drum

11 may be filled by both of them. Upon the rotation of the drum 11, the metal particles and steel balls are mixed with each other, and each time, both are advanced by the partition walls 13 until in consequence of the increasing inclination of the various partition walls 13 they slide off and drop down. At the same time the desired flattening of the various metal particles takes place between the balls and the drum with its partition walls.

By making the various parts of the right dimensions in proportion to each other and by using the proper quantities of metal particles and balls, an exceedingly good and comparatively quick flattening of the various particles is achieved, in spite of the device being of an extremely simple construction.

The partition walls 13 also advance the metal particles and drop them in a similar manner as is done with the steel balls until they have been turned up to a sufficient extent. In this way the powder is whirled up, and fresh particles constantly pass between the steel balls or between the steel balls and the wall of the casing respectively. In this case, the intensity of the stroke exerted by the steel balls can be adjusted within a wide range by the speed of the drum 11 with the partition walls 13. Apart therefrom, the height and intensity of the drop of the steel balls depend upon the number of the partition walls 13 and upon their width.

It has been shown by experiments that with the aid of steel balls having a diameter of from 3 to 5 millimetres, very good results are obtained. These numerous balls supply a large working surface so that a fine distribution of the powder over the various working surfaces takes place.

The number of balls used varies, of course, depending on their size, i. e. their diameter, and the kind of metal to be converted into powder. As the volume rather than the weight of the metal determines the number of balls used, a greater number of balls, for instance, is used in the case of aluminum than in the case of copper.

The device may, of course, be modified in many ways without departing from the nature of the invention.

Thus, for instance, the cylinder 11 may be made stationary, while the walls 13 are rotatable only.

I claim as my invention:

1. The method of producing a lustrous metal product composed of lamelliform particles for use in the manufacture of bronze paints, comprising subjecting the particles of previously finely comminuted metal to continual impact between a large number of tiny steel balls by imparting to said steel balls a revolving motion.

2. The method of producing a lustrous metal product composed of lamelliform par-

ticles for use in the manufacture of bronze paints, comprising subjecting the particles of previously finely comminuted metal to continual impact between a large number of tiny steel balls by imparting to said steel balls a revolving motion, and causing said steel balls to continually drop upon said particles.

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