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PROCESS FOR MAKING GRINDING SURFACES FOR CHARGE CONTAINERS

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Fig. 1.

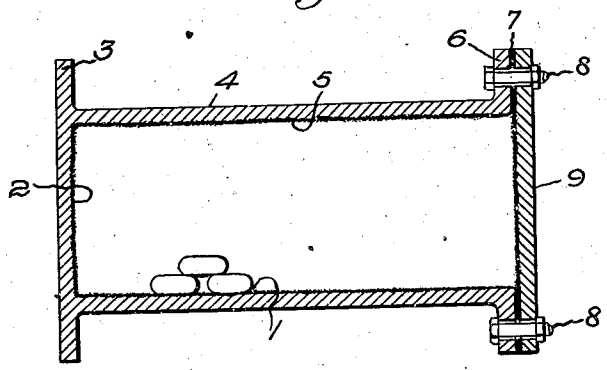
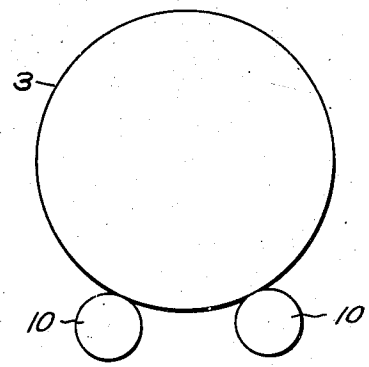


Fig. 2.



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PROCESS FOR MAKING GRINDING SURFACES FOR CHARGE CONTAINERS

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2 Claims. (Cl. 241—30)

This invention relates to a process for making a hard lining for a surface of a charge container for grinding hard material.

To illustrate the invention, the accompanying drawing shows by way of example a mill according to the invention, wherein:

Fig. 1 shows a longitudinal section of a mill container for grinding hard alloy constituents and having a grinding surface according to the invention; and

Fig. 2 illustrates diagrammatically one form of the driving mechanism for the mill.

The mill consists of a cylindrical container 4 of copper which is closed by a wall 2 at one of its ends and by a removable cover or lid 9 at the other open end 3. The cover 9 may be secured to the flange 6 of the container 4 by means of bolts 8 or equivalent members. The interior wall of the mill container has a grinding surface 5 of hard metal, produced in the manner described above, i. e., by pressing the pulverulent hard alloy into the soft copper wall, for instance during a preparatory operation of grinding.

When it is desired to use the mill for grinding hard alloy constituents the said constituents (in a pulverulent state) together with a grinding liquid such as methylene chlorine or the like are introduced into the container through the opening 3 (the cover 9 being removed) and in the same manner also suitable grinding bodies 1 such as rounded or cylindrical or otherwise shaped pieces of hard metal are introduced into the container 4. Then the cover 9 is secured to the flanges 6, preferably through the intermediary of a packing ring 7. The container is now caused to rotate, for instance by rotating the rollers 10 from a suitable source of power, resulting in the formation of a hard, not abrasible lining, rigid enough to withstand abrasion to a high extent during the grinding operations.

For the production of hard alloys by sintering it is necessary that the constituents be brought into a very finely divided state prior to the sintering operation. This fine division of the material is generally effected through grinding in a ball-mill. Since the constituents of hard alloys substantially consist of very hard materials, such as carbides, a very long grinding time is ordinarily required, so as to obtain the desired degree of fineness of the material. The long grinding time in connection with the hard material, however, results in wear of the mill surface and the mixture of the charge container wall material with the material to be ground becomes too great.

It is exceedingly important that the hard alloys, which generally have a composition very accurately proportioned, shall not be admixed with any foreign substances, since the quality will be impaired thereby very easily. In order to avoid impurities in the grinding material as far as possible, various expedients have been resorted to. According to one method, very hard and tenacious special steels have been brought into use as mill materials. Generally, however, iron is not a desirable admixing material, and the worn-off quantity of iron, although being comparatively small, is nevertheless sufficient in many cases to cause irregularities in the product obtained so as to impair the same. Furthermore, generally the special steels made use of are expensive and very hard to work, by reason of which the method in question will be found to be rather expensive. According to another method, a material which is one of the constituents of the material to be ground has been used as a mill material. In this case, no direct impurities caused by wear will be introduced into the grinding goods, but on the other hand a factor of uncertainty will arise on account of the fact that the quantity of worn-off material may vary from time to time, so that the uniformity in the quality will suffer. It is true that the grinding bodies or balls made from hard alloys of the same composition as that of the material to be ground is conceivable, but when attempts are made to make the mill or mill charge container lining itself from the said material, practical and economic difficulties arise.

The main object of the present invention is to provide a method, according to which practically the same result is obtained as if the mill consisted of hard metal. According to the invention there is used a mill provided with a grinding surface for the charge container consisting of one or more layers of finely divided hard material rigidly attached to the internal walls of the mill.

A further object of the invention is to produce the said layer in an exceedingly simple manner by making the housing or internal walls of the mill from a soft material, such as copper, which is adapted to receive the finely divided hard material, so that such material is caused to penetrate and adhere rigidly to the said soft material as a lining. It has been established that if one or a few preparatory grindings of hard material be effected in a mill of this kind, some of the hard metal powder or splinters will penetrate into the soft material and stick thereto, so that

the whole surface of the mill container gradually will be covered thereby as by a protecting jacket.

One could believe that where a material as soft as copper is selected, the wear would still be very great, and that the percentage of copper in the material ground would be found to be too high upon termination of the grinding operation. In contradistinction to what could be expetced, however, the copper percentage will be so low after a few grinding operations, even with the use of grinding material of hard metal, that it may be disregarded entirely. The table hereinbelow shows the copper percentage obtained in the ground material after the first four grinding operations as undertaken in a new mill.

Ordinal numbers of grinding operations	Copper percentage in grinding goods
I	0.41
II	0.14
III	0.07
IV	0.04

As will be seen, the copper percentage diminishes very rapidly, and after the fourth grinding operation it constitutes only about a tenth of the copper percentage obtained after the first grinding operation. The grinding-in process of new mills may be undertaken with materials to be ground intended for products in which a certain percentage of copper does not entail any drawback.

In place of copper, other material of similar properties may be employed, although copper has been found to be an exceedingly suitable example of materials answering the properties called for by the method. However, any soft material, metal or metal alloy or organic composition fulfilling the requirements as stated may be considered for use.

The construction of the mill may of course vary, but in its simplest embodiment it is constituted of a cylindrical container **4** provided with a cover **9** adapted to be secured thereon with a tight fit by means of a suitable securing means such as a screw device **8** and gasket **7**. If the mill be made from copper in its entirety, it may be found suitable to reinforce the same externally by rings **3—6** from some material resistant to wear. With these rings the mill may roll on the rollers **10** generally provided in the operation of mills of this kind. The rings may be made from iron, and, if desired, they may be covered with rubber.

It is also not necessary to make the whole mill from copper, the substantial point being that the internal walls **1—2** of the same are constituted of or coated with copper **5**. This may be effected by internally coating an iron vessel or the like with copper by electroplating.

According to the method set forth above the hard metal layer is applied only after the remainder of the mill has been manufactured. Although this method is believed to be the simplest and most suitable, there is no objection to making a special lining layer which then is attached to the mill. Thus, the finely divided hard metal layer may be applied by pressing or heating it on or in a suitable substance, whereupon the material thus obtained is used as a mill lining.

As many changes could be made in the above construction and many apparently widely different embodiments of the invention could be made without departing from the scope thereof, as defined by the following claims, it is intended that all matter contained in the above description shall be interpreted as illustrative and not in a limiting sense.

What I claim is:

1. That process of making a hard lining for the internal surface of a charge container of a mill for thereafter grinding hard material that may be used in carrying out a sintering or like method, which process of making the lining comprises the following steps; providing for the mill a grinding wall of copper which is essentially softer than said hard material; placing in the container provided with such wall a sufficient quantity of the said hard material for the making of preparatory grindings; then making such preparatory grindings in the presence of usual grinding bodies as employed in ball-mill grinding operations, and thereby reducing such hard material of said preparatory grindings into fine particles and mechanically pressing them by said preparatory grindings into the substance of said copper wall, so as to cause such fine particles to penetrate and adhere thereto, and thus provide for said copper wall a protecting jacket of one or more layers of finely divided hard material rigidly attached to the said internal copper wall of the mill container, whereby a grinding surface is provided for the container, in which container there may be ground into powdered form other quantities of such hard material for use in a sintering or like method.

2. That process of making a hard lining for the internal surface of a charge container of a mill for thereafter grinding hard material that may be used with a suitable binding agent in powdered form in carrying out a sintering or like method, which process of making the lining comprises the following steps; providing for the mill a grinding wall of copper which is essentially softer than said hard material; placing in the container provided with such wall a sufficient quantity of the said hard material for the making of a few preparatory grindings; then making such few preparatory grindings in the presence of usual grinding bodies as employed in ball-mill grinding operations, and thereby reducing such hard material of said few preparatory grindings into fine particles and mechanically pressing them by said few preparatory grindings into the substance of said copper wall, so as to cause such fine particles to penetrate and adhere thereto, and thus provide for said copper wall a protecting jacket of one or more layers of finely divided hard material rigidly attached to the said internal copper wall of the mill container, whereby a grinding surface is provided for the container, in which container there may be ground into powdered form other quantities of such hard material for use in a sintering or like method.

HANS HERMANN WOLFF.