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H. VOGT

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APPARATUS FOR PRODUCING POROUS SINTERED STRIP STOCK

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Fig. 2.

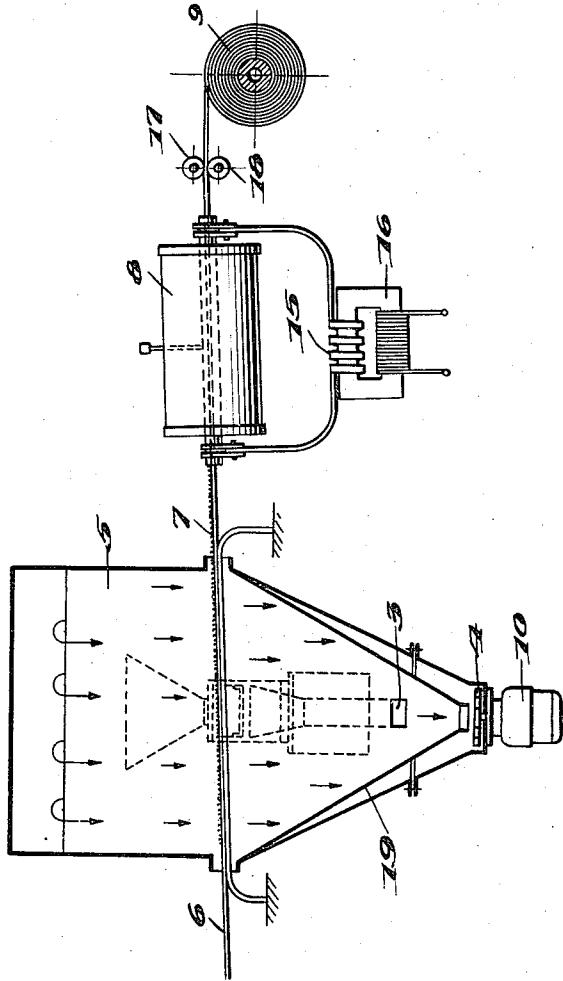
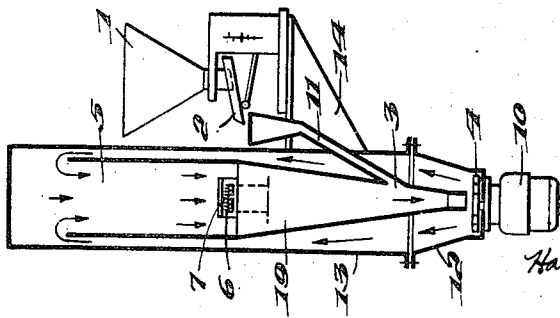


Fig. 1.



INVENTOR

Hans Vogt

BY

Pierce, Scheffler & Parker

ATTORNEYS

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APPARATUS FOR PRODUCING POROUS SINTERED STRIP STOCK

Hans Vogt, Erlau, near Passau, Germany

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2 Claims. (Cl. 266—2.5)

This invention relates to a method and arrangement for the production of highly porous sintered bodies, sintered skeleton foils or the like of very fine metal powder, obtained, for instance, from iron or nickel carbonyls or oxide powder and adapted, more particularly, for the production of electrodes for alkaline accumulators.

It is an object of the invention to provide simple means and method steps for producing a highly porous metal structure by continuously filling sintering moulds or applying a highly porous powder layer on a support.

With this and further objects in view, according to the present invention the sintering mould to be filled is placed in, or a support for a web of powder is passed through, a quieting chamber, into which is blown a continuous quantity of metal powder or the like, or in which the metal powder is whirled up in such a way that the powder particles are deposited by action of the quieting chamber. In other words, the powder particles are deposited from a condition of being freely floating in a gas-filled quieting chamber, the term "gas" in this case in particular meaning "air." In this way the sintering mould is filled without action of pressure and a powder web is produced on a travelling support by powdering or dusting. It will be understood that owing to the method of operation the powder particles are deposited in the mould or on the travelling support without any pressure and in this manner there is produced a highly porous layer of powder for forming the desired sintered bodies or sheets.

Advantageously the sintering moulds are arranged on a conveyor belt or the carrier sheet of a powder layer is used as a conveyor belt for this layer and passed continuously through the quieting chamber at an appropriate speed. The time of passage, i. e. the rate of feed, thus determines the height of filling of the mould, or the thickness of the powder layer, respectively. A continuous furnace through which the sintering moulds or the powder layers are passed and in which the highly porous pouring is sintered into the highly porous sintered body, sintered skeleton foil, or the like, may be arranged in direct succession to the quieting chamber.

In special cases the moulds or the powder web before being subjected to the sintering process, may pass successively through a plurality of separate quieting chambers arranged in series. There may be a continuous sintering furnace arranged between successive quieting chambers, so that it is possible to sinter in a continuous process, in steps, highly porous layers or pourings of very fine metal powder, e. g. of about 5 microns. Between the successive sintering stages there may take place a new dusting of powder mass and powders of a different type or particle size may be dusted into the sintering moulds or onto the carrier sheet in each of the successive quieting chambers. This method is particularly adapted e. g. for the production of highly porous sintered skeleton structures of thin electrode foils, preferably for alkaline storage batteries, and there may be successively dusted carbonyl iron or nickel powder and oxide or reduced metal powder onto a base or into a mould. By

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the stepwise sintering it is also possible to sinter together layers of different porosity.

An arrangement adapted for carrying out the method according to the present invention is shown by way of example in the drawing, in which:

Fig. 1 is a diagrammatic vertical section through a plant for carrying out the method according to the present invention, and

Fig. 2 is a vertical section at right angles to Fig. 1.

Similar reference numerals denote similar parts in the different views.

Referring to the drawing, it will be seen that the dust is sprayed continuously and uniformly, from a container or hopper 1, mounted on a bracket 14, through a vibratory chute 2 and a funnel 11, into the suction channel 3 of a blower 4 arranged on the conically tapered bottom end 12 of a casing 13 and driven by a motor 10. Owing to the fan effect the powder particles are finely dispersed by the air stream, taken along in the form of suspended or floating particles, and blown into the quieting chamber 5 in which they are deposited (as indicated by the arrows) on a metallic foil or strip 6, forming a loose, uniform dust or powder layer 7. The strip 6 passes continuously through the quieting chamber 5 and determines by its rate of feed the thickness of the powder layer 7 in case of a constant amount of powder blown into the chamber per unit of time. The strip 6 with its powder layer 7 then passes through an electrically heated sintering furnace 8 connected to the secondary coil 15 of a transformer 16, and between a pair of rollers 17 and 18, and is wound up on a roll 9 in the form of a highly porous sintered skeleton strip. It is also possible to have several sintering furnaces arranged in series in the course of the path of the foil strip, for sintering in steps. Also a heat-resistant conveyor belt may pass through the quieting chamber 5 and the sintering furnace 8 on which sintering moulds which have been filled with the dust powder in the quieting chamber 5 are arranged in a continuous succession.

The bottom part of the quieting chamber 5 terminates in a collecting chamber 19 connected to the suction end of the blower 4, for collecting the dust powder deposited outside of the sintering moulds or the base of the powder web.

The method according to the present invention provides favorable conditions for the continuous production of sintered skeleton electrode foils, more particularly, for alkaline accumulators, because it is thus possible to produce with relatively simple apparatuses highly porous sintered skeleton electrodes with very thin skeleton layers having a micro-porous structure. The attainable porosity depends upon the size and shape of the powder particles. It has been found that the total volume of the pores in an electrode skeleton structure consisting of a sintered layer of iron powder particles of about 5 microns and produced by the method according to the present invention amounted to 85 percent of the total volume of the electrode skeleton. The powder layers applied on carrier sheets by the method according to the invention are of highest uniformity provided that a predetermined amount of powder is sprayed on per unit of time, and that a predetermined rate of feed of the conveyor belt is maintained.

While the invention has been described in detail with respect to a now preferred example and embodiment of the invention it will be understood by those skilled in the art after understanding the invention that various changes and modifications may be made without departing from the spirit and scope of the invention and it is intended, therefore, to cover all such changes and modifications in the appended claims.

I claim:

1. Apparatus for manufacturing highly porous com-

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posite strip stock having a metallic sheet base and a uniform porous layer of metallic powder sintered thereon comprising a vertical quieting chamber open at its upper and lower ends with opposite walls of said chamber having openings therein through which the sheet base may be transported horizontally through said chamber, the lower portions of said chamber walls beneath said openings being convergently tapered to form a collecting chamber portion; means for continuously transporting said sheet base horizontally through said quieting chamber; means for introducing the metal powder within said collection chamber portion comprising a hopper external of said quieting chamber containing the metal powder, a vibratory chute beneath said hopper for continuously receiving said powder, and funnel means for delivering said powder from said chute into said collecting chamber portion; a casing completely enclosing said quieting chamber; a rotary blower positioned within said casing beneath said collecting chamber for withdrawing said powder by suction from said collecting chamber and for conducting said powder intermediate the external surfaces of the chamber walls and the internal surfaces of said casing to the upper opening of said quieting chamber to cause the powder particles to be freely suspended within said quieting chamber and to be deposited by gravity upon said continuously travelling sheet base; and a sintering furnace having an inlet and an outlet through which said sheet base and the powder deposited thereon is continuously fed horizontally therethrough.

2. Apparatus for manufacturing highly porous composite strip stock having a metallic sheet base and a uniform porous layer of metallic powder sintered thereon comprising a vertical quieting chamber open at its upper

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and lower ends with opposite walls of said chamber having openings therein through which the sheet base may be transported horizontally through said chamber, the lower portions of said chamber walls beneath said openings forming a collecting chamber portion; means for continuously transporting said sheet base horizontally through said quieting chamber; means for introducing the metal powder within said collecting chamber portion; a casing completely enclosing said quieting chamber; a rotary blower, positioned within said casing beneath said collecting chamber for withdrawing said powder by suction from said collecting chamber and for conducting said powder intermediate the external surfaces of the chamber walls and the internal surfaces of said casing to the upper opening of said quieting chamber to cause the powder particles to be freely suspended within said quieting chamber and to be deposited by gravity upon said continuously travelling sheet base; and a sintering furnace having an inlet and an outlet through which said sheet base and the powder deposited thereon is continuously fed horizontally therethrough.

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