Jan. 16, 1968 G. W. BALZ 3,363,368

METHOD FOR REMOVING FINISHING COMPOSITION ENTRAPPED IN FINISHED PARTS

Filed Oct. 20, 1965

Fig. 1

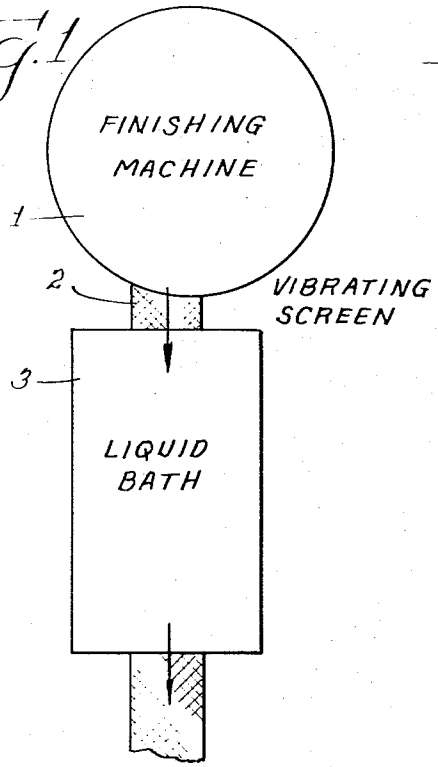


Fig. 2

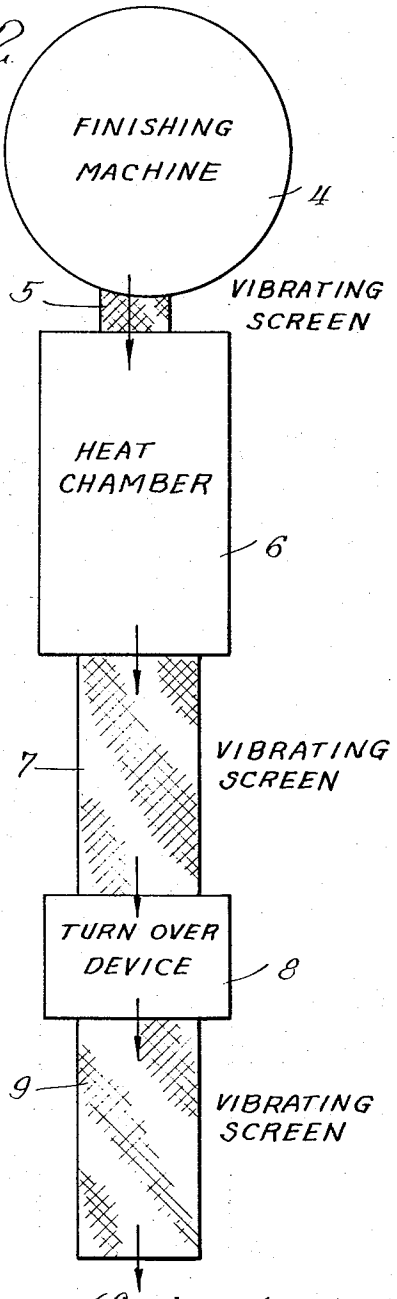
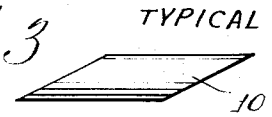


Fig. 3



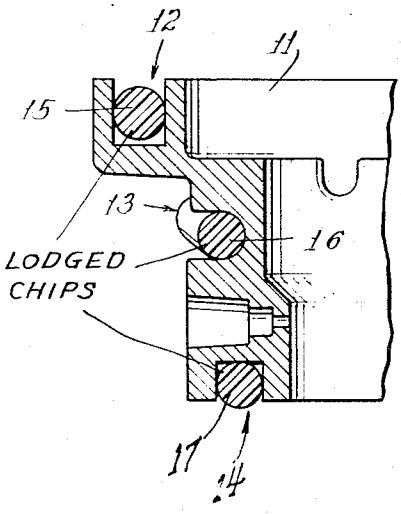


Fig. 4

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METHOD FOR REMOVING FINISHING COMPOSITION ENTRAPPED IN FINISHED PARTS

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The present invention relates to the finishing art and is more particularly concerned with a novel method for removing finishing composition pellets and portions thereof which are entrapped in the cavities of finished parts.

Finishing of parts, as for example metal parts prepared by machining or casting, is generally accomplished by tumbling or vibrating the parts in a chamber together with a finishing composition to cause relative motion between the parts and the finishing composition. Such composition generally comprises a mixture of relatively large pellets utilized as a bulking agent, together with a more finely divided abrasive material. Alternatively, the composition may comprise relatively large size pellets in which the more finely divided abrasive material has been dispersed, either uniformly or alternatively concentrated at the surface, center, or some other area thereof. Such pellets, or "chips" as they are commonly termed, may be prepared in any of many different forms such as triangles, rings, stars, bars, cylinders, tubes, and various other suitable forms.

Occasionally cast, molded, or machined parts are finished which have cavities, recesses or apertures provided therein as, for example, automotive carburetors. Some difficulty has been encountered in the finishing of such parts in that the pellets or chips often become entrapped or wedged in such cavities and recesses during the finishing process, and are not removed by ordinary separation methods, but must subsequently be removed individually by manual means. This additional step involving hand labor adds considerably to the cost of the finishing process.

It is accordingly an object of the present invention to provide an improved method for separating finishing material comprising relatively large pellets or chips from the recesses and cavities of parts in which they become lodged and entrapped. It is another object of the invention to provide such a method which may be relatively simply and inexpensively carried out as a part of an automatic finishing process, and without the necessity for special manual handling. Additional objects and advantages will be apparent to one skilled in the art, and still other advantages will become apparent hereinafter.

The invention in its preferred embodiment is illustrated by the accompanying drawing in which:

FIG. 1 is a flow diagram of one embodiment of a process according to the invention.

FIG. 2 is a flow diagram of a process constituting a modified embodiment of the invention.

FIG. 3 is a side elevation of a typical pellet or chip; and

FIG. 4 is a fragmentary cross-section of a part showing a plurality of chips entrapped in certain cavities thereof.

According to the invention, a finishing composition is provided comprising chips or pellets, usually of relatively large size compared to the size of the associated abrasive particles, and an abrasive material. The abrasive material may be provided as separate finely divided or particulate material, in which case the pellets or chips are utilized in the capacity of a bulking agent. Alternately, the abrasive particles may be dispersed within the chips, either uniformly or concentrated at the surface or center or at another particular portion thereof. A further

alternative involves the use of abrasive material either free or dispersed in a usual pellet or chip matrix together with the unique bulking material of the invention. A still further alternative involves use of abrasive material partly in a normal or usual pellet or chip matrix and partly in a matrix according to the invention. Other alternatives will be obvious. The material from which the chips are produced is so chosen that it has a lower thermal coefficient of expansion than that of the parts to be finished. Consequently, as an additional step in the finishing process, as an expedient for removing chips which may have become entrapped within cavities of the part to be finished, the parts containing the entrapped pellets are separated from the loose finishing composition and placed in a heat chamber. As the temperature is elevated, the parts expand to a greater degree than the pellets. The temperature is raised to at least that point at which the differential in expansion is sufficient to release the pellets, and to permit them to be disengaged from the cavities of the parts and to be separated therefrom.

Reference is now made to the accompanying drawing for a better understanding of the invention, wherein all the parts are numbered and wherein the same numbers are used to refer to corresponding parts throughout.

FIG. 1 is a flow diagram illustrating one embodiment of the method of the present invention. As shown, the parts and finishing composition are first subjected to a finishing process which may involve any one of many such methods and apparatus commonly used, as for example a deburring process in a suitable finishing apparatus **1**. After the parts have been properly finished, the mixture comprising the parts and finishing composition is removed from the finishing machine and the parts separated from the free finishing composition by means of an apparatus such as a vibrating screen **2**. The separated parts, which may contain entrapped finishing pellets, are then transferred to a preferably inert liquid bath, such as a water bath **3**. The liquid bath **3** is maintained at a temperature sufficiently high to cause the parts to expand to a sufficiently greater extent than the pellets so that the pellets are released, permitting them to be dislodged from the openings or cavities of the parts and to fall to the bottom of the bath, where they may be removed or recovered by suitable means. Where the parts contain cavities at their upper surfaces which continue to retain the dislodged chips, they may be subjected to a tumbling operation to permit the contained chips to be removed by means of gravity. Such chips may subsequently be removed by any suitable means such as a vibrating screen.

FIG. 2 illustrates another embodiment of the invention which may be utilized where a higher temperature is required to cause the parts to expand sufficiently to free the pellets. Such a higher temperature is necessary when, for example, the thermal coefficient of expansion of the parts is only slightly greater than that of the finishing composition. As shown in the drawing, after proper finishing in a suitable finishing machine **4**, the parts are separated from the free finishing composition by any suitable means such as a vibrating screen **5**. The separated parts, containing entrapped pellets, are then conveyed to a heat chamber **6** maintained at a temperature sufficiently high to cause the parts to expand and release the pellets. The mixture comprising the finishing composition and parts is then conveyed over a vibrating screen **7** for removing the dislodged chips. The separated parts, where necessary, may be transferred to a turnover device **8** for separating chips still remaining in upwardly disposed cavities, and the chips so separated removed over a second vibrating screen **9**.

One commonly used type of chip or pellet **10** is illustrated in FIG. 3, and shown imbedded in various cavities of a part in FIG. 4. The part shown in fragmentary cross-

sectional view comprises a carburetor **11** having openings or cavities **12**, **13**, and **14**, in which are wedged chips **15**, **16**, and **17**. Upon entrance of the part into the heating chamber, chips such as **16** and **17** are readily dislodged. However, in order to dislodge chips such as **15** contained in upwardly directed cavities it is usually necessary to subject the part to a turnover device **8** as shown in FIG. 2.

The composition of the finishing material may be one of several types. In one embodiment the pellets themselves do not contain any abrasive material, but are utilized primarily as a bulking agent, applying a force pressing the abrasive material against the surface of the parts. Such pellets may be formed of any commonly used materials such as crushed limestone in any of various shapes and sizes. The abrasive comprises a separate component, generally in finely divided or particulate form. Alternatively, the abrasive material may be dispersed or imbedded within the chips, either uniformly therein or concentrated on the surface or some other portion thereof. In this embodiment the chips perform a dual function, as a bulking agent and as an abrading agent. However, regardless of whether separate or combined pellets and finishing material is employed, the material of which the pellets are composed, either in toto or as a matrix, must have a lower thermal coefficient of expansion than the parts which are to be finished.

In carrying out the finishing process, the finishing material including chips, as prepared in either form described above, are placed together with the parts to be finished in a suitable finishing machine. After the finishing process has been carried to the required degree, the parts are transported into a heating chamber, either in the form of a liquid bath as shown in FIG. 1, or an air-heating chamber as shown in FIG. 2.

Liquid baths may generally be maintained at temperatures of up to 200° F. Where higher temperatures are required, air baths may be utilized and maintained at temperatures of up to 350° F. and even higher.

Among the various materials of which the pellets or chips may be made are limestone, ceramic materials, aluminum, zinc, plastics, porcelain, and steel.

Among the various abrasive materials which may be used in finely divided or particulate form, either as a separate component or imbedded or dispersed in the chips, are emery, Carborundum, diamond dust, and many others known in the art.

Typical examples of operative combinations are as follows:

Part:	Pellet
(1) Steel	Aluminum.
(2) Zinc-based die casting	Porcelain.
(3) Brass	Steel.
(4) Steel	Ceramic.
(5) Steel	Zinc die casting.
(6) Steel	Plastic with low coefficient of expansion.

It is to be understood that the invention is not limited to the exact details of construction, operation, or exact materials or embodiments shown and described, as obvious modifications and equivalents will be apparent to one skilled in the art, and the invention is therefore to be limited only by the scope of the appended claims.

I claim:

1. In a method for finishing parts which comprises subjecting said parts and a finishing composition to movement causing relative motion between said parts and said finishing composition, and subsequently separating said parts from said finishing composition, the improvement

wherein said finishing composition comprises a plurality of pellets and an abrasive material, said pellets being comprised of a material having a thermal coefficient of expansion which is lower than that of said parts, and wherein said method comprises the further step of heating said parts to a temperature sufficient to cause said parts to expand and to release pellets which have become entrapped by said parts during the finishing process.

2. In a method for finishing parts which comprises subjecting said parts and a finishing composition to movement causing relative motion between said parts and said finishing composition, and subsequently separating said parts from said finishing composition, the improvement wherein said finishing composition comprises a mixture of a plurality of pellets and a more finely divided abrasive material, said pellets being comprised of a material having a thermal coefficient of expansion which is lower than that of said parts, and wherein said method comprises the further step of heating said parts to a temperature sufficient to cause said parts to expand and to release pellets which have become entrapped by said parts during the finishing process.

3. A method according to claim **2**, wherein said pellets are comprised of aluminum.

4. A method according to claim **2**, wherein said pellets are comprised of zinc.

5. A method according to claim **2**, wherein said pellets are comprised of ceramic.

6. A method according to claim **2**, wherein said pellets are comprised of plastic.

7. A method according to claim **2**, wherein said pellets are comprised of steel.

8. A method according to claim **2**, wherein said pellets are comprised of porcelain.

9. In a method for finishing parts which comprises subjecting said parts and a finishing composition to movement causing relative motion between said parts and said finishing composition, and subsequently separating said parts from said finishing composition, the improvement wherein said finishing composition comprises a plurality of pellets comprising a matrix and abrasive material dispersed therein, said matrix being comprised of a material having a thermal coefficient of expansion which is lower than that of said parts, and wherein said method comprises the further step of heating said parts to a temperature sufficient to cause said parts to expand and to release pellets which have become entrapped by said parts during the finishing process.

10. A method according to claim **9**, wherein said matrix is comprised of aluminum.

11. A method according to claim **9**, wherein said matrix is comprised of zinc.

12. A method according to claim **9**, wherein said matrix is comprised of plastic.

13. A method according to claim **9**, wherein said matrix is comprised of ceramic.

14. A method according to claim **9**, wherein said matrix is comprised of porcelain.

15. A method according to claim **9**, wherein said matrix is comprised of steel.

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