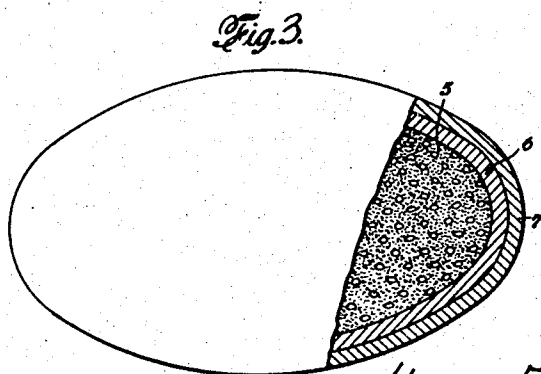
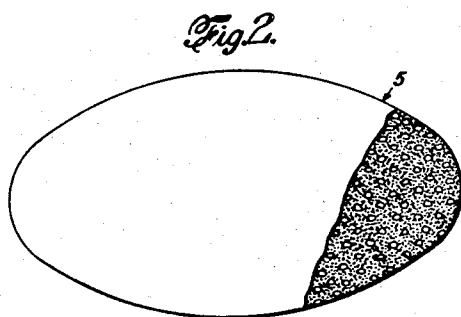
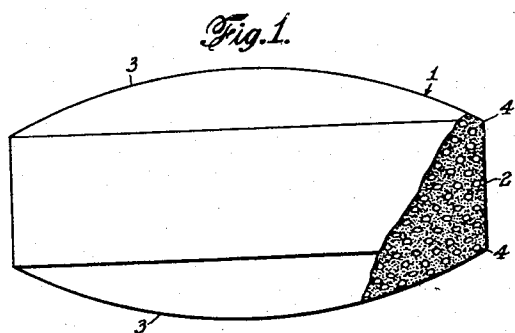


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METHOD OF MAKING TABLETS  
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## UNITED STATES PATENT OFFICE

2,410,110

## METHOD OF MAKING TABLETS

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mesne assignments, to Brewer & Company, Inc.,  
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setts

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7 Claims. (Cl. 167—82)

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This invention relates to compressed tablets and to the method of making the same. More particularly, this invention relates to compressed tablets having a protective coating of substantially uniform thickness and to the method of making the same.

Compressed pharmaceutical tablets made by tablet-compressing machines are characterized by straight sides and edges and are of the geometrical form of a short cylinder, the ends of which are curved (convex).

In the prior art, it has been customary to coat compressed pharmaceutical tablets by tumbling them in a coating pan, which consisted of a vessel of circular cross-section and a continuously curved contour. Successive applications of sugar syrup, sometimes with fillers, such as chalk, kaolin, etc., were made while the tablets were being tumbled therein, dry air being blown over them. This procedure resulted in building up a continuous coating of sugar on the surface of the tablets. The sugar coating built up around each tablet formed a finished product whose exterior surface approximated an ellipse, even though the tablet originally and before coating had edges and straight walls. However, the coating was not of uniform thickness. The coating on the cylindrical straight wall of the compressed tablet was filled out and considerably thicker than the coating on the curved ends.

Sugar coatings are useful for many purposes but are objectionable in certain instances as, for example, when the tablet contents are in part liquid. In such cases, the liquid ingredients might seep through the heterogeneous crystalline sugar coating whereby the exterior surface of the product would be stained and also have imparted thereto an odor. Sugar coatings are also brittle and quite permeable to oxygen, with the result that they do not afford the protection which is necessary in many instances. In many kinds of tablets, it is desirable to have a better degree of protection than is afforded by sugar coatings. This is especially true in the case of poly-vitamin tablets wherein at least some of the vitamins are extraordinarily sensitive to oxygen, light, etc.

An object of this invention is a compressed tablet in the form of a continuously curved geometric solid, such as an oblate spheroid or ellipsoid of revolution, and provided with a coating of substantially uniform thickness.

Another object of this invention is a compressed tablet in the form of a continuously curved geometric solid, such as, for example, an oblate spheroid or ellipsoid of revolution, and containing a plurality of vitamins wherein at least some of the vitamins are extraordinarily sensitive to oxygen, light, etc., and provided with a protective coating of substantially uniform thickness.

A further object of this invention is a method

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of producing compressed tablets in the form of continuously curved geometric solids, such as, for example, oblate spheroids or ellipsoids of revolution.

An additional further object of this invention is a method of treating compressed tablets whereby a protective coating of substantially uniform thickness can be applied thereto, and applying such protective coating.

Other objects will become apparent from the following description, appended claims, and accompanying drawing wherein:

Figure 1 is an enlarged elevation of a tablet (partially broken away) made by a tablet-compressing machine;

Figure 2 is an enlarged elevation of a compressed tablet (partially broken away) resulting from the treatment of the tablet shown in Figure 1 in accordance with this invention; and

Figure 3 is an enlarged elevation of the finished coated tablet (partially broken away) made in accordance with this invention.

In accordance with the principles of this invention, the ingredients constituting the tablets are compressed in a tablet-forming machine to produce compressed tablets characterized by straight sides or edges and of a geometric form of a short cylinder, the ends of which are either curved (convex) or flat. The compressed tablets are then tumbled for a protracted period of time in a tumbling barrel or rotating vessel analogous to a tablet-coating pan but without any coating substance therein. The continuous tumbling causes the tablets to abrade one another, wearing away the surface at the edges more rapidly and more deeply than the curved areas. In this way, the tablets are self-abraded. This self-abrasion of the tablets is continued until the tablets have assumed a shape which is the resultant of the original shape and the effective abrasion, i. e. tablets having a continuously curved exterior surface, such as, for example, an ellipsoid.

The size and weight of the original compressed tablet will be reduced by the self-abrasion, but allowance is made for this in calculating the formula and size of tablet coming from the tablet-compressing machine so that the final abraded ellipsoid will be of the desired size and contain the ingredients in sufficient amount to provide the desired dosage. The dust resulting from the abrasion is returned to the next batch of composition which is to be compressed so that no net loss, or in any case very little loss of the valuable ingredients, may be incurred.

When the abrasion dust has been removed in any appropriate manner, the ellipsoids may be coated with the appropriate solution or composition, as desired. Since the tablets have no straight sides or edges, the coating thereon will

be continuous and of substantially uniform thickness.

In one form of the invention, the tablet contains a plurality of vitamins and minerals. In this embodiment of the invention, the ingredients are homogeneously mixed together in the proper amounts, with the ingredients therein which deleteriously affect each other being isolated therefrom, as will be hereafter more fully explained, so that the deleterious effects are inhibited.

The compressed poly-vitamin-mineral tablet, after being subjected to the self-abrading process hereinbefore described, is coated with a colloid to afford substantial protection to the ingredients. In the coating operation, the colloid is dissolved in water at an elevated temperature to produce a solution in which the concentration of the colloid is such that, upon cooling, the colloid will set to form a firm jelly.

The abraded poly-vitamin-mineral tablets will be at least in part water-soluble. If a hot aqueous solution of the selected colloid is applied directly to the abraded tablets, the superficial solid ingredients thereof which are soluble will dissolve and diffuse to some extent into the colloid. In order to avoid this effect, the abraded ellipsoids are first given a thin coating of an edible resin, such as shellac or the like, prior to the application of the protective coating. Preferably, the abraded ellipsoids are tumbled in an alcoholic solution of the resin in a coating pan of the usual type, and thereafter air is blown thereover until the resin coating is thoroughly dried. The resin-coated smooth ellipsoids are then given the protective coating of colloid.

In the preferred embodiment of this invention, shellac is employed as the undercoating and gelatin as the colloid coating, though it will be obvious to a person skilled in the art that other substances may be used. Any edible substance of suitable solubility characteristics which can be applied in a medium which does not deleteriously affect the ingredients of the tablet and which is not deleteriously affected by water may be used to produce the undercoat. Any edible colloidal substance which can be dissolved in water and which can be set, as, for example, by drying, cooling, etc., and which will substantially resist the penetration of oxygen may be used. Obviously, both of the coatings must also be of a nature so that they can be either assimilated or permit the ingredients of the tablet to be assimilated in the human system when taken orally.

Hereinafter, there is set forth a specific illustrative preferred example of the invention which, it is to be understood, is in no wise limitative thereof:

#### EXAMPLE

| Ingredient                   | Material                                                      | Quantity per 3,000 tablets |
|------------------------------|---------------------------------------------------------------|----------------------------|
|                              |                                                               | Grams                      |
| Vitamin A.....               | Fish liver oil concentrate, 200,000 units vitamin A per gram. | 20                         |
| Vitamin B <sub>1</sub> ..... | Crystalline thiamin chloride.....                             | 0.696                      |
| Vitamin G.....               | Crystalline riboflavin.....                                   | 1.85                       |
| Vitamin P—P.....             | Crystalline niacinamide.....                                  | 9.13                       |
| Vitamin C.....               | Crystalline ascorbic acid.....                                | 30.0                       |
| Vitamin D.....               | Vitosterol in oil, 400,000 units per gram.                    | 1.0                        |
| Calcium and phosphorous.     | Calcium pyrophosphate.....                                    | 820                        |
| Iron.....                    | Iron ammonium citrate brown (U. S. P.).                       | 75                         |

#### PROCEDURE

##### Preparation of vitamin A beadlets

Dissolve 24 grams of gelatin and 36 grams of corn syrup in 50 grams of water. Heat to 65° C. and emulsify 20 grams of vitamin A concentrate in the hot solution. Form the emulsion into beadlets according to my United States Patent No. 2,183,053, or United States Patent No. 2,183,084. Or, alternatively, pour the hot emulsion onto the cold surface, such as plate glass, cool, chill, strip off, dry, and grind to 40 mesh fineness. In the case of granulation made by grinding the dried sheet, wash with a fat solvent, such as light petroleum, to remove vitamin A concentrate exposed in the grinding, and evaporate traces of residual solvent. The result will be a fine vitamin A powder.

##### Preparation of the iron ammonium citrate beadlets

The following ingredients, in the proportions set forth, are formed into beadlets as hereafter described:

|                              |            |     |
|------------------------------|------------|-----|
| Gelatin .....                | grams..... | 175 |
| Corn syrup .....             | do.....    | 250 |
| Water .....                  | cc.....    | 400 |
| Iron ammonium citrate brown, |            |     |
| U. S. P.....                 | grams..... | 75  |

Dissolve the iron ammonium citrate in 400 cc. of water, and thereafter dissolve therein 250 grams of corn syrup, stirring well. Add to this solution 175 grams of the U. S. P. gelatin. Allow to soak overnight, then heat to 65° C. to a viscous solution. Form this into beadlets as above described.

The iron compound and the vitamin A would be incompatible in intimate contact, since the iron would constitute a catalyst for the oxidation of vitamin A.

Also, the same incompatibility applies to iron and vitamin C or ascorbic acid. These incompatibilities have been overcome by the imprisonment of vitamin A in one batch of gelatin granules or beadlets, and the iron in another batch, while the vitamin C being a dry granulation powder is also isolated from the iron.

If desired, all the vitamins compatible with vitamin A may be incorporated in the same beadlets. Also, the matrices of the beadlets may be formed of agar, pectin, methyl cellulose, etc.

The granulation of all the other ingredients, except the vitamin A beadlets, the iron beadlets and vitamin C, is prepared, after which the vitamin A beadlets, the iron beadlets and the granules of vitamin C are substantially homogeneously distributed throughout the granulation. The granulation is compressed into tablets, as shown in Figure 1 and wherein the reference numeral 1 discloses the tablet as it comes from the tablet-making machine. As is apparent from Figure 1, the tablet 1 has the geometric form of a small cylinder in which the cylindrical wall 2 is straight and the ends 3 are convex.

A plurality of the compressed tablets are introduced into a tumbling pan, preferably consisting of a vessel of circular cross-section and having a continuously curved contour similar to the construction of the usual sugar-coating pans. The tablets 1 are tumbled in the pan and caused to abrade each other. The tumbling, and hence the abrasion, is continued until the edges 4 and the cylindrical walls 2 are rounded off and the tablets approximate ellipsoids in shape, such

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as, for example, shown in Figure 2 and designated generally by the reference character 5.

The dust resulting from the abrasion is then removed in any convenient manner, and the resulting tablets, which are now in the shape of ellipsoids, are coated with an alcohol solution of shellac to provide the undercoat 6. The shellac undercoating 6 is preferably applied in a tumbling pan of the usual type. After drying, the shellac-coated tablets are coated with gelatin to provide the protective coating 7. The gelatin coating 7 is continuous and of substantially uniform thickness around the tablet. Likewise, also, the shellac coating 6 intermediate the tablet 5 and the protective gelatin coating 7 is continuous and of substantially uniform thickness.

The final coated tablet, due to the substantially uniform coatings, has a continuously curved surface and is of a geometric form which is substantially ellipsoidal. By virtue of the herein described process, the high speed production of tablet-compressing machines can be utilized in the production of tablets having a continuous protective coating of substantially uniform thickness. Though the tablets contain liquid ingredients, nevertheless such ingredients are incorporated in the form of beadlets to produce a substantially dry product and to isolate the incompatible ingredients from each other.

Though in the specific illustrative preferred embodiment the tablet is formed of a multi-vitamin-mineral granulation, it is to be understood that the invention is not restricted thereto but is applicable to any tablet having a straight side and edges and which is to be coated. Likewise, the invention is not restricted to a plurality of coatings. If the nature of the tablet permits, an appropriate protective or flavoring coating may be applied directly thereto.

Since it is obvious that various changes and modifications may be made in the above description without departing from the nature or spirit thereof, this invention is not restricted thereto except as set forth in the appended claims.

I claim:

1. A method which comprises tumbling compressed tablets having edges and a straight side to cause said tablets to abrade one another and continuing the tumbling until the tablets have acquired shapes approximating ellipsoids.

2. A method which comprises tumbling compressed tablets having edges and a straight side to cause said tablets to abrade one another, said tablets being formed of a granulation containing a plurality of vitamins and minerals and wherein the incompatible ingredients are isolated from each other by being separately incorporated in different beadlets having matrices of a gelable colloid, and continuing the tumbling until the tablets have acquired shapes approximating ellipsoids.

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3. A method which comprises tumbling compressed tablets having edges and a straight side to cause said tablets to abrade one another, said tablets being formed of a granulation containing beadlets of a gelable colloid having vitamin A incorporated therein and beadlets of a gelable colloid having a mineral which is incompatible with vitamin A or any other ingredient in the granulation incorporated therein, and continuing the tumbling until the tablets have acquired shapes approximating ellipsoids.

4. A method which comprises tumbling compressed tablets having edges and a straight side to cause said tablets to abrade one another, said tablets being formed of a granulation containing a plurality of vitamins and minerals and wherein the incompatible ingredients are isolated from each other by being separately incorporated in different gelatin beadlets, and continuing the tumbling until the tablets have acquired shapes approximating ellipsoids.

5. A method which comprises tumbling compressed tablets having edges and a straight side to cause said tablets to abrade one another, said tablets being formed of a granulation containing gelatin beadlets having vitamin A incorporated therein and gelatin beadlets having a mineral which is incompatible with vitamin A or any other ingredient in the granulation incorporated therein, and continuing the tumbling until the tablets have acquired shapes approximating ellipsoids.

6. A method which comprises tumbling compressed tablets having edges and a straight side to cause said tablets to abrade one another, said tablets being formed of a granulation containing a plurality of vitamins and minerals and wherein the incompatible ingredients are isolated from each other by being separately incorporated in different gelatin beadlets, continuing the tumbling until the tablets have acquired shapes approximating ellipsoids, applying a coating of an edible resin to said ellipsoids, and applying a protective coating of a colloidal substance which substantially resists the penetration of oxygen on said resin coating.

7. A method which comprises tumbling compressed tablets having edges and a straight side to cause said tablets to abrade one another, said tablets being formed of a granulation containing gelatin beadlets having vitamin A incorporated therein and gelatin beadlets having a mineral which is incompatible with vitamin A or any other ingredient in the granulation incorporated therein, continuing the tumbling until the tablets have acquired shapes approximating ellipsoids, applying a coating of shellac to said ellipsoids from a solution which does not affect the tablet, and thereafter applying a gelatin coating on said shellac coating.

HARDEN F. TAYLOR.