PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Improvements in or relating to Capsules

We, FIRMA VEREINIGTE KAPSELFABRIKEN NACKENHEIM A.G., a Company organised under the Laws of Germany, of Nackenheim am Rhein, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

Conical metal foil caps or capsules to be filled with powder, for example, are, for the purpose of dispatch, fitted into one another and are packed in the form of rods which are formed in this way. Owing to the small thickness of wall and the usual differences in length between such caps, jamming frequently occurs which is increased still further by upsetting owing to shocks and falls during transport or by subsequent "sweating" of the varnish coatings or adhesive positions, so that the individual caps often stick to one another firmly and scarcely detectably and cannot be separated without being damaged. Intermediate layers of smooth or even waxed strips of paper for the purpose of avoiding these disadvantages require tedious work and are also expensive.

The invention obviates these disadvantages in a simple manner by virtue of the fact that the end wall, which is formed by folding over the conically tapering end of the shell of the cap, possesses an increased thickness at a partial area owing to the folding and pressing of an end of the shell with at least, in part, a greater width than corresponds to the radius of the end face. The frusto-conical foil shell, which is wound at the narrow end in the known manner, for example over a mandrel, has, for example, over its entire periphery for the part which is provided for the formation of the end wall, a greater width than the radius of the finished end wall, so that, on the folding over, the part which projects beyond the centre of the end wall can be bent off on the inner or outer face of the end wall and can be twisted into a firm convex knot and compressed. On fitting into one another a number of caps which have such a central knot, there remains between the individual caps in this way a sufficient distance which obviates jamming or sticking together, even without the assistance of intermediate layers of paper, and facilitates the separation of the caps that have been fitted together.

The knot may be formed in various ways. For example, the shell part provided for this purpose may, before being flanged in or before the production of the end wall, be flanged forward, so that, on folding the end wall, there is first produced a conical heaping up of foil which can then be twisted and compressed by suitable devices, for example a multi-jaw chuck. The flat pot surface of the wound cone may be provided with a deepened trough and protuberances are formed by stamping or shaping, which has the advantage that the end walls of the caps which are fitted into one another touch one another on small surfaces, i.e., practically only at points.

For the purpose of forming a thickened portion on the end wall, the body of the shell, which is formed by spiral winding of a cutting of metallic foil, may also be folded over at its conically tapering shell-surface end folds; also, the individual folds may be laid on one another in order to obtain thickened end-wall sections.

The shell parts, which are provided for the formation of the knot, may, in the production of the cutting of foil, also be provided with lug or tooth-like recesses on their lateral edges, which recesses are pushed in various directions into one another in the formation of the knot. The cap may, in addition, be formed of a number of layers of foil which, if required, may be of different sizes and of different material from one another for example they may consist of separate foils which are backed with paper or with

[Price 2/8]

cellulose derivatives. The shell of the cap may be provided with stamped designs, for example dome-shaped or honeycomb stampings or stampings resembling the graining of leather, so that the flexibility and the snug adhesion to the neck of the bottle are improved.

In particular, owing to the formation of numerous capillary passages which are hardly visible to the naked eye and do not disturb the appearance of the end wall, the advantage is obtained that a restricted exchange of air is possible which permits the breathing of the cork without having to fear the introduction of impurities to the bottle opening by dust or insects. It has been found to be advantageous to reinforce the end wall with additional applications of, for example, adhesives, care being taken, however, that the aforesaid capillary passages do not become closed. This result is obtained by application of the adhesive at points. If the cap is required for purposes in which an hermetic closure is desired, it may also be provided on the outside with a coating of varnish or only the end wall may be covered with varnish. The inside of the cap may be lined with adhesive from the end of the finished bowl up to the proximity of the end wall.

The production of the conical bowl cap is advantageously carried out as follows: the foil ~~cutting~~ are obtained from strips of foil which are bounded by the parallel longitudinal edges of the strip of foil and two arcuately extending edges with the centres of the arcs lying eccentrically to the central line of the foil and these cuttings are wound spirally to form a conical bowl, in such a manner that one of the arcuate edges forms a regular arc whilst the other gives the spiral flange edge which, by being turned over, is folded into an end wall and is given the finished shape by consolidating operations such as pressing, sticking or the like.

Conical bowl caps made of ~~foil~~, the side shells of which are formed by folding, are, as a rule, made from circular discs, whilst caps with wound shells are produced from the development of a truncated cone. The two kinds are produced from strips of foil and require complicated and expensive stamping tools. Also, these basic forms give rise to considerable stamping waste, for the collection and conveying away of which special devices are necessary. The stamping waste is all the more costly since, as a rule, valuable, for example printed, varnished and stamped material is employed for the foils. A further disadvantage of the cap with a longitudinally folded side shell is that it has to be gummed for the purpose of obtaining the fold, with the result that frequently the opening of the bottle becomes covered with adhesive and the cork, in many cases, becomes undesiredly closed in an airtight manner and, consequently, is prevented from breathing. Natural corks require a limited admission of air in order to prevent putrefaction. For this purpose, perforation of the end walls of the caps is known, by means of which the stamped appearance of the end wall is damaged and also dust and insects gain admission to the cork.

These disadvantages are entirely obviated by manufacture in the manner just described. A basic form, with two longitudinal edges guided parallelly in a straight line and two transverse edges which are bent into part circles joining the two longitudinal edges respectively at the same angle, can be produced with simple cutting tools without any waste clippings from a strip of foil having a width equal to the distance between the two longitudinal edges of the basic form. The basic form may be wound on a conical winding mandrel, one of the transverse edges, preferably the one that is curved outwards, forming the edge of the bowl and the other laying itself spirally on the winding cone. By folding over the head of the winding cone, the projecting part of the shell is formed into a flat end wall and pressed.

The drawings show a few examples of bowl caps according to the invention and their process of production. Of these:—

Fig. 1 represents the foil shell unwound with preliminarily grooved flanged edges for the formation of the end wall and the knot;

Fig. 2 shows the wound frusto-conical shell;

Fig. 3 shows a section of the shell with a partially bent in end-wall edge and an inwardly flanged portion of the shell forming the knot;

Fig. 4 shows, in the same representation as Fig. 3, the shape of the cap with a flatly placed end wall and conical state of the knot part;

Fig. 5 represents the cap shown in Fig. 4 after rotating the conical part;

Fig. 6 shows another basic form with a toothed side edge;

Fig. 7 represents the wound foil shell of the basic form shown in Fig. 6;

Fig. 8 represents a section of the form of the foil shell shown in Fig. 7 after turning over the fold of the end wall that is formed from the end of the surface of the shell;

Fig. 9 shows diagrammatically the pressing of the knob-forming part of the

end wall between an inner stamper with a central depression at the head end and a flat outer stamper;

Fig. 10 shows the same pressing operation with an inner stamper, the depression in which is serrated;

Fig. 11 is a section through three caps, which are nested in one another, with metal knots according to the invention;

Fig. 12 is a section through a corked neck of a bottle with a forced-on foil cap according to the invention;

Fig. 13 shows a strip of foil from which three basic forms can be separated by cutting along arcuate bounding edges as separating lines;

Figs. 14 to 19 show the process of manufacture in the formation of the bowl by winding and turning over of the end wall until the finished bowl cap is formed, and

Fig. 20 shows another embodiment of a finished bowl cap according to the invention.

According to Figs. 1 to 12 there have been selected, as basic forms, developments of truncated cones 1 (Fig. 1) or with toothed edges 2 (Fig. 6). The inner end, which has been preliminarily grooved at 3 for the formation of the end wall, and at 4 for the formation of the knot, is so dimensioned that first, after turning over the knot-forming part inwards or outwards or over or under the end wall, a conical fold at the centre, denoted by 5, is produced, which, when turned about the axis with a suitable tool, forms the knot-shaped body 6 which is formed between the conical inner stamper 7 with the trough-shaped depression 8 at the head end and the flat outer stamper 9 by pushing into one another and pressing to form a knob-shaped knot. By means of serrations 10 in the trough of the conical inner stamper 11 shown in Fig. 10, the surface of this knob-shaped body assumes the form shown in Figs. 10 and 11.

On employing a basic form shown in Fig. 6 with a toothed side edge 4 of the shell part which is to be turned over on line 3, a preliminary grooving of the knot-forming section can be dispensed with. The folds of the end wall which are formed are, in this case, pushed into one another and the thickened part thus formed is, in addition, shaped, in the same way as shown in Figs. 9 to 11, into smooth or stamped knots. The sections 12 of foil strip (Fig. 13) shows how, by means of the separating cuts 15 which extend from one edge 13 of the strip to the other edge 14 of the strip and which can be made in a continuous operation by simple cutting tools such as transverse cutters, basic forms are produced which, by winding over a winding mandrel (not shown) are formed into bowl-shaped caps. The transverse edges 15 (corresponding to the separating cuts 15) correspond to arcuate sections with centres which lie eccentrically to the central line of the foil strip and which join the two longitudinal edges respectively at the same angle. The outwardly curved edge is, in this case, selected as the outer edge of the bowl cap shown in Fig. 14, so that the other transverse edge runs round the winding cone, ascending spirally in a sufficient width (Figs. 15 and 16), so that a spiral-shaped flanged edge 16 (Fig. 17) is also formed which, after turning over on line 17 and by folding, forms the eccentric foldings of the end wall. The end wall may then be stamped to provide fine air passages and, through a corresponding position of the folds, may have a more or less thick eccentric thickening of the end wall, which thickening can be formed in the manner hereinbefore described, by means of suitably shaped inner and outer stampers.

What we claim is:—

1. A thin-walled conical cup capsule of preferably metallic foil material the bottom of which is formed by folding and pressing the end of a shell from which the capsule is formed and which has a greater width than the radius of the completed capsule bottom characterised in that the bottom of the capsule is substantially perpendicular to the cone axis and has in the centre thereof a knot which projects from the bottom towards the interior of the capsule.

2. A capsule according to claim 1, characterised by the feature that the knot is formed by stamping.

3. A capsule according to claim 1, characterised by the feature that it is formed by spirally winding at least one foil cutting which has, in the conically tapering end of the peripheral surface which is provided for the end wall, a thickness which is increased at a partial area, preferably by folding.

4. A capsule according to any of the preceding claims, characterised by the feature that it consists of a plurality of layers of foil cuttings which are different in kind from one another, such as metal foils and metal foils which are lined with paper or cellulose derivatives.

5. A capsule according to any of the preceding claims, characterised by the feature that the end wall is patterned and additionally strengthened by stamping.

6. A capsule according to any of the preceding claims, characterised by the feature that the folds which form the end wall are felted by being curled together.

end wall between an inner stamper with a central depression at the head end and a flat outer stamper;

Fig. 10 shows the same pressing operation with an inner stamper, the depression in which is serrated;

Fig. 11 is a section through three caps, which are nested in one another, with metal knots according to the invention;

Fig. 12 is a section through a corked neck of a bottle with a forced-on foil cap according to the invention;

Fig. 13 shows a strip of foil from which three basic forms can be separated by cutting along arcuate bounding edges as separating lines;

Figs. 14 to 19 show the process of manufacture in the formation of the bowl by winding and turning over of the end wall until the finished bowl cap is formed, and

Fig. 20 shows another embodiment of a finished bowl cap according to the invention.

According to Figs. 1 to 12 there have been selected, as basic forms, developments of truncated cones 1 (Fig. 1) or with toothed edges 2 (Fig. 6). The inner end, which has been preliminarily grooved at 3 for the formation of the end wall, and at 4 for the formation of the knot, is so dimensioned that first, after turning over the knot-forming part inwards or outwards or over or under the end wall, a conical fold at the centre, denoted by 5, is produced, which, when turned about the axis with a suitable tool, forms the knot-shaped body 6 which is formed between the conical inner stamper 7 with the trough-shaped depression 8 at the head end and the flat outer stamper 9 by pushing into one another and pressing to form a knob-shaped knot. By means of serrations 10 in the trough of the conical inner stamper 11 shown in Fig. 10, the surface of this knob-shaped body assumes the form shown in Figs. 10 and 11.

On employing a basic form shown in Fig. 6 with a toothed side edge 4 of the shell part which is to be turned over on line 3, a preliminary grooving of the knot-forming section can be dispensed with. The folds of the end wall which are formed are, in this case, pushed into one another and the thickened part thus formed is, in addition, shaped, in the same way as shown in Figs. 9 to 11, into smooth or stamped knots. The sections 12 of foil strip (Fig. 13) shows how, by means of the separating cuts 15 which extend from one edge 13 of the strip to the other edge 14 of the strip and which can be made in a continuous operation by simple cutting tools such as transverse cutters, basic forms are produced which, by winding over a winding mandrel (not shown) are formed into bowl-shaped caps. The transverse edges 15 (corresponding to the separating cuts 15) correspond to arcuate sections with centres which lie eccentrically to the central line of the foil strip and which join the two longitudinal edges respectively at the same angle. The outwardly curved edge is, in this case, selected as the outer edge of the bowl cap shown in Fig. 14, so that the other transverse edge runs round the winding cone, ascending spirally in a sufficient width (Figs. 15 and 16), so that a spiral-shaped flanged edge 16 (Fig. 17) is also formed which, after turning over on line 17 and by folding, forms the eccentric foldings of the end wall. The end wall may then be stamped to provide fine air passages and, through a corresponding position of the folds, may have a more or less thick eccentric thickening of the end wall, which thickening can be formed in the manner hereinbefore described, by means of suitably shaped inner and outer stampers.

What we claim is:—

1. A thin-walled conical cup capsule of preferably metallic foil material the bottom of which is formed by folding and pressing the end of a shell from which the capsule is formed and which has a greater width than the radius of the completed capsule bottom characterised in that the bottom of the capsule is substantially perpendicular to the cone axis and has in the centre thereof a knot which projects from the bottom towards the interior of the capsule.

2. A capsule according to claim 1, characterised by the feature that the knot is formed by stamping.

3. A capsule according to claim 1, characterised by the feature that it is formed by spirally winding at least one foil cutting which has, in the conically tapering end of the peripheral surface which is provided for the end wall, a thickness which is increased at a partial area, preferably by folding.

4. A capsule according to any of the preceding claims, characterised by the feature that it consists of a plurality of layers of foil cuttings which are different in kind from one another, such as metal foils and metal foils which are lined with paper or cellulose derivatives.

5. A capsule according to any of the preceding claims, characterised by the feature that the end wall is patterned and additionally strengthened by stamping.

6. A capsule according to any of the preceding claims, characterised by the feature that the folds which form the end wall are felted by being curled together.

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7. A capsule according to any of the preceding claims, characterised by the feature that the folds which form the end wall include among themselves fine capillary passages which render possible a ventilation which just permits the breathing of the cork.

8. A capsule according to any of the preceding claims, characterised by the feature that it has, on the inside of its wall, applications of adhesives which leave free capillary passages in the end wall.

9. A capsule according to any of the preceding claims, characterised by the feature that the inside of the cap is coated only from the edge up to near the end wall with a water-soluble or self-adhering adhesive.

10. A capsule according to any of the preceding claims, characterised by the feature that at least the end wall is provided with a coating of varnish.

11. A method of producing thin-walled conical capsules according to any of the preceding claims, characterised by the feature that a cutting foil material is wound, for example over a winding core, into a conical shell, the end of the peripheral surface being first beaded over and shaped into a somewhat conical structure, the latter being twisted in itself and formed between stampers into a firm knot with the end wall.

12. A method according to claim 11, characterised by the feature that the part of the end of the peripheral surface of the foil is provided on its side edge with recesses, for example with teeth, which are pushed into each other to form a projecting knot.

13. A method according to claims 11 and 12, characterised by the feature that the thickened part of the end wall is formed with a raised, domed surface.

14. A method according to any of claims 11 to 13, characterised by the feature that there are obtained from a strip of foil, by continuous dissevering, cuttings which are bounded by the parallel longitudinal edges of the strip of foil, the arcuate separating edges having their arc centres lying eccentrically to the centre line of the foil, these cuttings are each spirally wound into a conical shell body, in such a manner that one of the arcuate edges forms a closed bowl edge, the other edge following the edge of the flange, and a shell section, which is provided for the formation of the end wall, is formed into an end wall by turning over, folding and consolidation operations, such as pressing, sticking together or stamping.

15. A method according to any of claims 11 to 14, characterised by the feature that the folds, which are formed from the turned-over conically tapering end of the peripheral surface and which are laid eccentrically in the plane of the end wall, are made into a closed end wall and, if required, the end wall is strengthened and shaped, in addition, by stamping or the like.

16. Capsules, substantially as hereinbefore described with reference to and as illustrated by the accompanying drawings.

17. A method for manufacturing capsules, substantially as hereinbefore described.

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J.D.

