

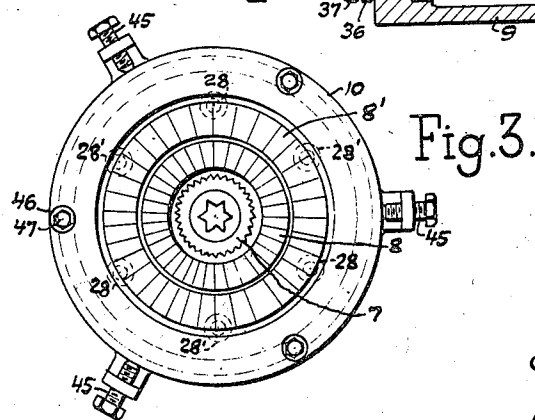
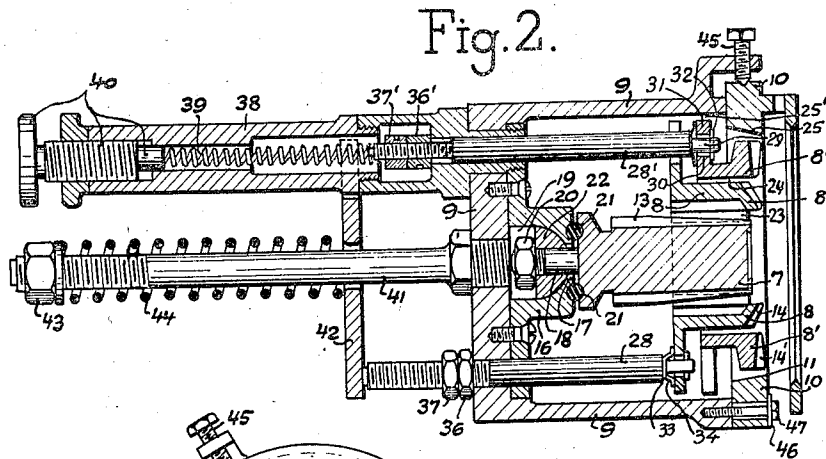
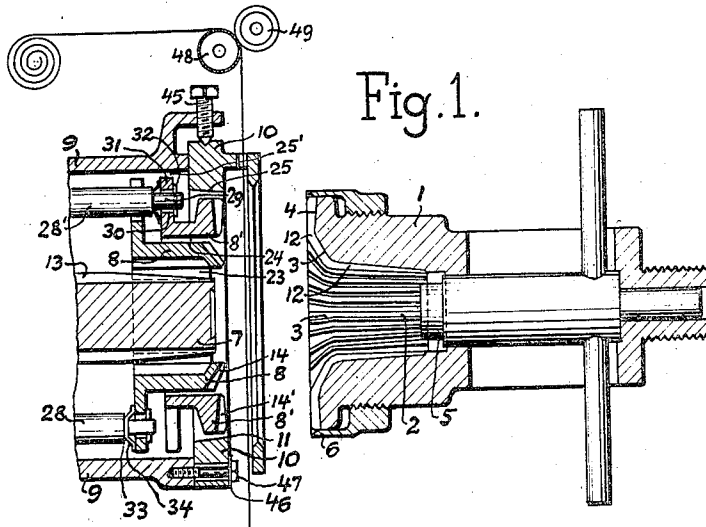
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O. J. BRUUN

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MACHINE, FOR MAKING PLAITED METAL FOIL CAPSULES

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INVENTOR:
OTTO JOHANNES BRUUN
BY: Francis E. Boyce

ATTORNEY

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MACHINE FOR MAKING PLAITED METAL-
FOIL CAPSULES

Otto Johannes Bruun, Copenhagen, Denmark

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17 Claims. (Cl. 93—60)

The present invention relates to machines for the manufacture of corrugated or plaited metal-foil capsules, the said machines being of the kind in which a matrix with a funnel-shaped orifice cooperates with a patrix encircled by a spring-actuated annular piston, or several such pistons encircling each other, which in consequence of one of the said two main members moving forward relatively to the other one, is or are pushed backward by the orifice funnel of the matrix so as to move along the patrix against an increasing spring pressure, at the same time as the capsule blank situated between the end surfaces of the pistons and the orifice funnel is pulled away below the piston or pistons by the patrix, and is compelled to enter together with the latter into the matrix.

In order that the corrugations may be uniformly disposed it is common, in such machines, to have the orifice funnel of the matrix fitted with corrugations following the generatrices, and to provide corresponding cams on the end surface of the pistons, which are shaped so as to fit the orifice funnel, and similarly to provide such corrugations and cams on the matrix and patrix themselves.

The heretofore known machines for making plaited capsule have, owing to their unsuitable construction, been unable to satisfy the gradually increasing demand for quick performance of the work on thin and cheap capsule material and also the considerable height of capsule now required after it has become common to use plaited capsules made from thin metal foil as ornamental capsules on bottles.

An important defect in the known machines is that the pistons have been guided by telescoping tightly in one another, so that they have only been able to perform a purely axial motion. Owing to the irregularities always to be taken into account partly in the construction of the machine and the fastening of the tools and partly in the thickness and hardness of the capsule material, the above mentioned circumstance may have for its consequence that the blank will not be pinched with the same force all around between the orifice funnel of the matrix and the piston ends, so that the entire spring pressure resting on a piston may be acting at one single point, where the blank then will be held and therefore be torn, at the same time as the patrix pulls the blank away below the remaining part of the piston.

By the machine according to the present invention the advantage is attained that a consid-

erably thinner and therefore cheaper material than heretofore can be used, and that the capsules of this material can be made with a far greater height and with more numerous and more regular plaits than heretofore, while at the same time the speed of manufacture is greatly increased, without any risk of tearing the capsule blank, and according to the invention this advantage is attained principally by the feature that during the entire process of manufacture the forces acting on the capsule are caused to be elastically resilient to a far greater extent than heretofore known, and the machinery parts are made self-adjusting relatively to each other, as far as feasible in all directions. This result is attained by various mutually co-operating arrangements, and for instance the annular spring-actuated piston or pistons encircling the patrix and one another are separated from the patrix and from one another and from any surrounding parts by a small space and are suspended in such a manner that each of the pistons, in any position during the return motion along the patrix, independently of one another, can perform a small tilting motion relatively to the patrix, but with a tendency to return to a normal position, in which the said piston is co-axial to the said patrix.

Also the circumstance that the patrix in the known machines is absolutely rigidly mounted may cause difficulties on account of irregularities of the above mentioned nature, as even the slightest obliquity or an increased thickness of the capsule material at one single point will cause the pressure between the matrix and patrix at this point to be several times greater, whereby the capsule may be damaged. According to the invention this defect may be remedied by supporting the patrix in such a manner that the same can yield resiliently to a relatively small pressure from any side.

Ordinarily the capsule blank is stamped from a strip of metal foil by means of a circular knife which is moved towards the strip and further on through an accurately fitting circular and slightly flaring hole in a support for the strip, the said support forming thus a knife flange adapted to co-operate with the circular knife. When according to the invention the patrix is supported in such a manner that the same can yield resiliently to pressures from the side, then the knife flange which in this case cannot with certainty be centered relatively to the patrix must be made adjustable in such a manner that it can be adjusted with absolute accuracy relatively to the path of the circular knife. Also this circum-

stance is taken into consideration by the machine according to the invention.

As a further supplement to the above mentioned special manner of supporting the annular pistons and the patrix, the desired elastic actuation of the capsule material according to the invention may be increased by fitting the machine with a special stamping device serving to corrugate or grain the capsule material in such a manner that the same is caused to be elastically yielding in the direction of its thickness. This graining or fluting which in practice acts as an increase in the thickness of the capsule material, can be performed in such a manner, that the material will be embossed with various decorative patterns with impressed trade marks and the like in relief.

The machine according to the invention operates so smoothly and regularly that the corrugations and cams of the matrix and patrix, without causing difficulties of any kind, can be made sloping or with a scalene cross-section, whereby the advantage is attained that the machine can produce metal-foil bottle capsules with sloping plaits, which capsules as it is well known are especially easy to apply to bottles, as such a capsule merely has to be exposed to a circumferential pressure in order to be caused to fit firmly and permanently about the bottle neck, independently of the shape of the latter.

One construction of the invention is illustrated by way of example on the drawing.

Fig. 1 shows an axial section of the matrix of a capsule-making machine and the front part of the corresponding patrix, and also the device for feeding forward the strip of metal foil.

Fig. 2 a corresponding section of the patrix, illustrating an organization of spring devices for independently controlling the inner and outer rings or pistons of the machine.

Fig. 3 the patrix viewed from the end facing the matrix.

1 (Fig. 1) is the matrix or matrix block with the matrix cavity 2, the orifice funnels 3 and 4, the discharge piston 5 and the circular knife 6.

Together with the patrix 7 (Figs. 1 and 2) the annular pistons 8 and 8' are built into a casing 9, which supports the knife flange 10 with the annular knife 11.

The matrix and the orifice funnel thereof are fitted along the generatrices with corrugations 12, and the patrix and the end faces of the annular pistons, the taper of which is adjusted according to the orifice funnel, are fitted with corresponding cams 13, 14 and 14', respectively.

The patrix 7 is attached to the bottom of a casing 9, suitably to a base member 16 screwed to the bottom of the casing itself and fitted at the top with a hole 17 for the bottom pin 18 of the patrix and, at the bottom, with a recess 19 for a nut 20 at the end of the said pin. In order to enable the patrix to yield resiliently to lateral pressures a buffer is provided, for instance in the shape of a rubber ring or some other elastic washer between the base member and the bottom of the casing, or as shown in Fig. 2 in the shape of a rubber ring 21 or the like between the base member and the patrix, and in the latter case a hemispherical supporting block 22 is inserted between the nut and the correspondingly hemispherical roof of the recess 19', and the hole 17 is then made amply wide.

The annular pistons 8 and 8' encircling the patrix are separated from one another and, as far as the inner and outer pistons are concerned, also

from the patrix 7 and, respectively, the casing 9 and the knife flange 10 by a small space 23, 24 and 25 and 25', and each of the pistons is supported by three spring-actuated guide pins 28 and 28', respectively, (see Figs. 2 and 3) in such a manner that the said pistons, independently of one another can perform a small tilting motion relatively to the patrix, no matter how far back on the latter they might have been pushed by the orifice funnel of the matrix, as the guide pins serving to enable such a tilting motion of the pistons to take place are sufficiently loosely connected to the pistons, for instance in the following manner. The top end of each of the guide pins is fitted with a neck 29 passing with a certain small play 30 through a hole in a lug or flange 31 on the piston, and the connection between the said parts is secured by a split pin 32 or the like, and a buffer spring 34 is inserted between the rear side of the lug or flange 31 and the shoulder 33 on the guide pin, the said buffer spring maintaining the pistons lifted as high on the neck as permitted by the split pin 32.

Each of the guide pins 28, 28' is guided by passing through the bottom of the casing for the patrix, and is threaded outside thereof and is fitted with a nut 36 (with check nut 37), or respectively 36' (and 37'), which nuts serve as adjusting screws for the adjustment of the pistons, in such a manner that the end surfaces of the pistons will be at the same and correct level all the way round, when the machine is standing in the initial position.

Fig. 2 illustrates a construction in which the guide pins 28' associated with the outer annular piston 8' are controlled by individual spring devices, while the guide pins 28 associated with the inner annular piston 8 are all controlled by a centrally disposed spring device. Each of the said individual spring devices is constructed as follows:

Behind each of the guide pins 28' a spring case 38 is provided, on the bottom of the patrix, for a helical spring 39 resting against the end of the guide pin concerned and against a plug screw 40 inserted into the end of the spring case and serving also as an adjusting screw for regulating the compression of the spring.

The centrally disposed spring device for controlling the inner piston is constructed as follows: On a pin 41 pointing towards the rear and screwed firmly into position at the centre of the bottom wall of the patrix, a plate 42 is inserted, which serves as a support for the ends of the pins 28, and is only loosely guided on the said pin 41, and between the rear side of the said plate and a nut 43 at the end of the pin a powerful helical spring 44 is inserted, which spring will then be tightened more and more, the farther the piston 8 is forced back by the matrix. Supposing the pins 28 to rest on the plate 42 at three points forming the apexes of an equilateral triangle the centre of which is at the axis of the pin 41, then it is seen that the entire spring pressure will distribute itself with one third on each of the three guide pins. For each pin the pressure is transmitted through the above mentioned buffer spring 34, which further will have to take up the increased pressure due to any tilting of the piston. The nut 43 serves as an adjusting nut for regulating the compression of the helical spring 44.

In the construction shown, the adjustability of the annular knife relatively to the path of the matrix, as required on account of the tilting of the patrix, is effected in the following manner: The knife flange 10 is free to slide on the open

end of the patrix casing 9, and is held in position along its periphery by means of three pointed screws 45, which at the same time serve as adjusting screws, the adjustment being effected by loosening the knife flange and placing the same around the matrix, which is then pushed over the patrix, whereby the annular knife comes into contact with the patrix casing, and is then fixed into position there by means of the pointed screws.

For the purpose of further securing the knife flange 10 in the position thus fixed, there may be used screws 47 preferably fitted with washers 46 and passing through amply large holes in the knife flange and screwed into threaded holes in the end of the patrix casing. This arrangement, however, may also be used as an independent adjustment device for the knife flange.

In connection with the devices mentioned above, and in order to provide further security for a fully satisfactory operation, the machine is fitted, in the construction shown, with a combined feeding and stamping device for the metal foil strip, viz, two co-operating feed rollers 48 and 49 (see Fig. 1), one of which, the bottom roller 48 is of hard material and has a finely grained or fluted surface, while the other one, the top roller 49, is made from or coated with paper substance, rubber or some similar material adapted to yield to the pressure from the decorated bottom roller, in such a manner that the strip of foil, after having passed between the rollers, will present a grained or corrugated surface corresponding exactly to the stamping pattern of the bottom roller.

Instead of having two annular pistons as shown on the drawing, the machine may be fitted with merely one or with three of still more such pistons, and instead of the patrix being stationary and the matrix movable the matrix may be stationary and the patrix movable.

The arrangement shown is merely given by way of example, and may be replaced by other ones for the same purpose, without the latter coming thereby outside of the scope of the invention.

Having thus described my invention, what I claim is:—

1. A machine for manufacturing plaited metal-foil capsules and the like, comprising a matrix having a funnel-shaped orifice, a patrix cooperating therewith, and a spring-actuated annular piston encircling said patrix and tiltable relatively thereto, the organization being such that upon relative movement of the matrix and patrix toward each other the said funnel-shaped orifice will engage said piston and move the same along the patrix against increasing spring tension.

2. A machine for manufacturing plaited metal-foil capsules and the like, comprising a matrix having a funnel-shaped orifice, a patrix cooperating therewith, and a plurality of flexibly supported annular pistons encircling said patrix, said pistons being spaced from each other and from the patrix thereby to permit tilting movement of the pistons, the organization being such that upon relative movement of the matrix and patrix toward each other the said funnel-shaped orifice will engage said pistons and move the same along the patrix against increasing tension.

3. A machine for manufacturing plaited metal-foil capsules and the like, comprising a matrix having a funnel-shaped orifice, a patrix coop-

erating therewith, and a plurality of annular pistons each resiliently supported at a plurality of points uniformly distributed about the patrix, said pistons being spaced from each other and from the patrix, thereby to permit independent tilting movement of the pistons, the organization being such that upon relative movement of the matrix and patrix toward each other the said funnel-shaped orifice will engage said pistons and move the same along the patrix against increasing tension.

4. A machine for manufacturing plaited metal-foil capsules and the like, comprising a matrix having a funnel-shaped orifice, a patrix cooperating therewith, a plurality of annular pistons encircling said patrix, and a plurality of spring-actuated guide pins uniformly distributed about the patrix and flexibly connected with said pistons for supporting the same thereby to permit tilting movement of the pistons relatively to the patrix, the organization being such that upon relative movement of the matrix and patrix toward each other the said funnel-shaped orifice will engage said pistons and move the same along the patrix against increasing tension.

5. A machine for manufacturing plaited metal-foil capsules and the like, comprising a matrix having a funnel-shaped orifice, a patrix cooperating therewith, a casing for said patrix, a plurality of annular pistons encircling said patrix, and a plurality of spring-actuated pins guided through the bottom of said casing and flexibly connected with said pistons for supporting the same thereby to permit tilting movement of the pistons relatively to the patrix, the organization being such that upon relative movement of the matrix and patrix toward each other the said funnel-shaped orifice will engage said pistons and move the same along the patrix against increasing tension.

6. A machine as set forth in claim 5, and characterized by the provision of means outside of the patrix casing for independently adjusting the tension on said guide pins.

7. A machine as set forth in claim 5, the spring tension for the pins being provided by helical springs supported in housing secured in said patrix casing in alinement with said pins.

8. A machine for manufacturing plaited metal-foil capsules and the like, comprising a matrix having a funnel-shaped orifice, a patrix cooperating therewith, a casing for said patrix, a plurality of annular pistons encircling said patrix, a set of spring-actuated pins for each of said pistons, said pins being guided through the bottom of said casing and flexibly connected with their respective pistons for supporting the same, all of the pins of one set being mounted on a single plate, a supporting pin secured in the bottom of said casing and passing loosely through said plate, and a helical spring carried by said supporting pin and exerting tension on said plate to urge it toward the casing.

9. In a machine of the character described, a patrix casing, and a patrix elastically mounted in said casing whereby the patrix is resiliently yieldable to a relatively small pressure at any side thereof.

10. In a machine of the character described, a patrix casing, a buffer device secured on the base of said casing, and a patrix mounted on said buffer device thereby to resiliently support the patrix.

11. In a machine of the character described, a matrix having a circular knife, a patrix casing, 75

a patrix flexibly carried thereby in cooperating relation with said matrix, and a knife flange adjustably carried by said patrix casing and forming an annular knife for cooperation with the

5 knife of the matrix.

12. In a machine of the character described, a matrix having a circular knife, a patrix casing, a patrix flexibly carried thereby in cooperating relation with said matrix, a knife flange carried

10 by said patrix casing and forming an annular knife for cooperation with the knife of the matrix, and threaded screws carried in said casing and contacting with the periphery of said knife flange for adjusting the latter.

13. In a machine for manufacturing plaited

15 metal-foil capsules and the like, a matrix member and a patrix member mounted for relative movement with respect to each other, said patrix member having an annular piston surrounding

20 and spaced therefrom, and means for flexibly supporting said annular piston for angular relative movement with respect to said patrix member.

14. In a machine for manufacturing plaited

25 capsules, matrix and patrix members mounted for relative movement with respect to each other, an annular piston surrounding said patrix member and spaced therefrom, means for flexibly supporting said annular piston independent of

said patrix member, and means for exerting a resilient pressure on said annular piston on relative movement of said matrix and patrix members.

15. In a machine for manufacturing plaited 5 capsules, a matrix having a funnel shaped orifice, a patrix cooperating therewith, a plurality of annular pistons encircling said patrix, means for flexibly supporting said annular pistons with respect to said patrix, and tension means adapted 10 to resiliently press said annular pistons towards said matrix on relative movement of said patrix and matrix.

16. In a machine for making plaited capsules, a matrix and a patrix member, said patrix mem- 15 ber having a plurality of annular pressure-applying pistons encircling and spaced from the same, and flexible supporting means for said patrix and annular pistons, whereby said pistons and patrix member are adapted to assume angu- 20 lar dispositions with respect to one another.

17. In a capsule-making mechanism, a matrix and a patrix mounted for relative movement with respect to each other, an annular pressure applying piston encircling and spaced from said 25 patrix, and flexible mountings for said patrix and annular piston adapted to permit misalignment of the patrix with respect to said annular piston.

OTTO JOHANNES BRUUN.