Oct. 21, 1947. A. F. STAGMEIER 2,429,376

METHOD AND APPARATUS FOR FORMING THREADED CAPS AND LIKE ARTICLES

Filed April 18, 1944

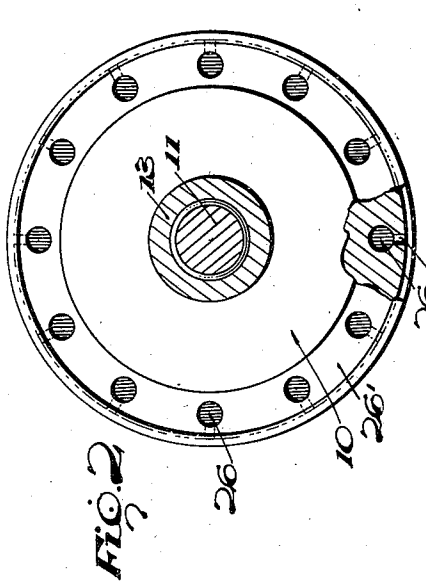


FIG. 2.

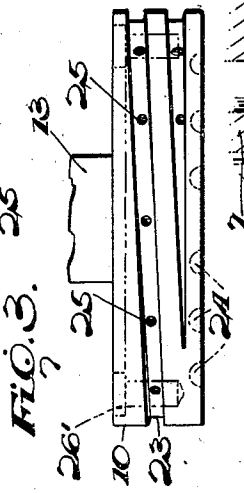


FIG. 3.

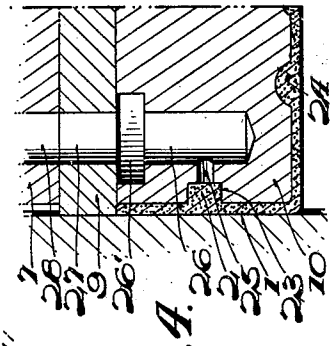


FIG. 4.

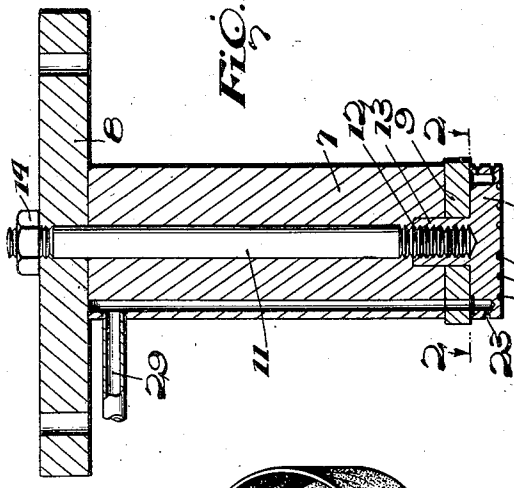
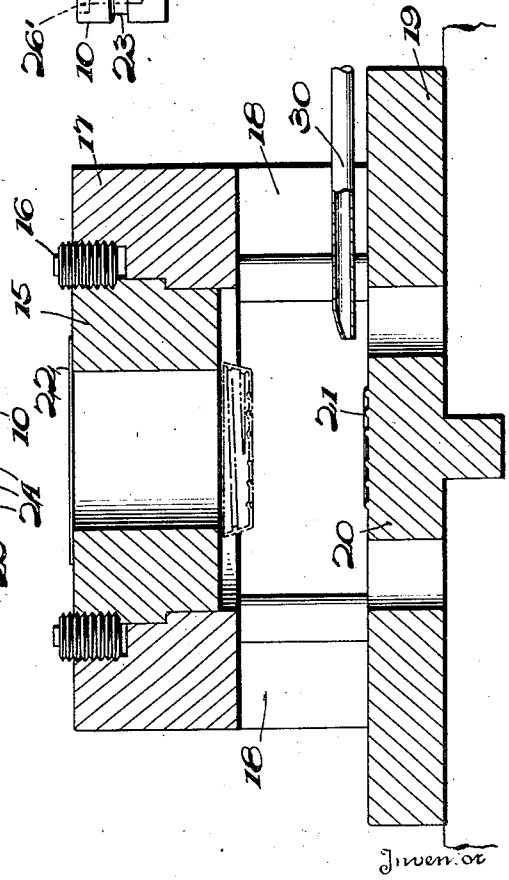


FIG. 1.



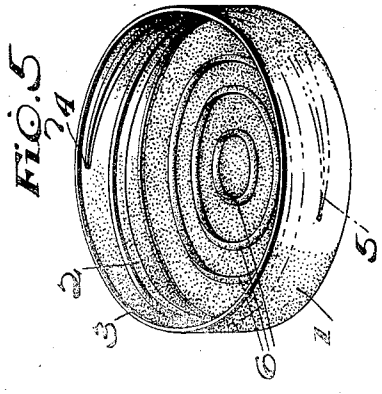


FIG. 5.

Inventor

Arthur F. Stagmeier

By Cameron, Kerkam & Sutton

Attorneys

Patented Oct. 21, 1947

2,429,376

UNITED STATES PATENT OFFICE

2,429,376

METHOD AND APPARATUS FOR FORMING THREADED CAPS AND LIKE ARTICLES

Arthur F. Stagmeier, Upper Montclair, N. J., assignor to General Foods Corporation, New York, N. Y., a corporation of Delaware

Application April 18, 1944, Serial No. 531,682

5 Claims. (Cl. 93—36.5)

1

This invention relates to the manufacture of cap-shaped articles having rims with inward projections, such as threaded caps for containers, bottles, jars, cans and the like, and more particularly to the removal of such formed articles from the forming element. For convenience the following description pertains to the manufacture of threaded caps, but it will be apparent that the invention is not limited thereto.

When a threaded cap or like article is formed or shaped on a forming element, usually a punch which cooperates with a suitable die, it cannot be stripped off longitudinally due to the interengagement between the thread in the forming element or punch and the corresponding thread in the rim of the cap. In general, two methods have been used heretofore for removing such caps. In some cases means such as a traveling belt have been provided for rotating the formed cap on the punch in the proper direction to spin it off, and in other cases the forming head of the punch has been made collapsible to release the cap. The use of a collapsible punch, however, requires mechanism which is costly to manufacture and difficult to maintain in proper adjustment and on the other hand, the difficulties in properly adapting and synchronizing the operation of unscrewing devices with a reciprocating punch are considerable. Moreover, in certain types of caps it is desirable to use a thread which terminates short of the top of the cap or short of the edge of the lip or rim of the cap, or both. For example, a thread that extends to the top of the cap may complicate the use of the usual inner paper liner or gasket, whereas a thread extending to the edge of the lip or rim may be undesirable in the case of caps made of material such as paper and the like.

According to the present invention, broadly considered, the cylindrical rim of the cap is spread by fluid pressure directed radially outwardly against the rim to disengage the thread in the rim from the corresponding thread in the forming element, after which the cap can be stripped off or otherwise removed from the forming element in a longitudinal direction. If the material of the cap rim is not sufficiently stretchable and pliable, it may be desirable to divide the rim into two or more sections by longitudinal or axial slits to facilitate the desired spreading. If the material is sufficiently elastic, the rim may return to the desired cylindrical shape due to its own elasticity, but if it does not do so, further treatment may be desirable such as forcing the cap through a circular die opening, a tube, etc.

2

The fluid pressure may be supplied conveniently by passages in the forming element which direct the fluid radially outward against the rim, and preferably the outlets of these passages are located in the bottoms of the grooves in the forming element so as to disengage the portions of the cap which project into these grooves. The fluid pressure is controlled in timed relation with the cap forming operation to disengage or release the caps one by one as they are formed, and in some cases this pressure will have or can be arranged to have a longitudinally acting component sufficient also to remove the caps. In case caps still tend to adhere to the forming element after the rims are spread, however, it is desirable to provide longitudinally acting stripping means which engage and remove the caps positively from said element.

By way of example, the invention is described hereinafter in connection with the manufacture of threaded caps of paper, cardboard, and like materials by a punch and die operation. Usually such rims are sufficiently pliable and stretchable that they can easily be spread by radially directed pneumatic pressure. After the cap has been formed by relative movement between the punch and die members, further relative movement causes the separation of the punch and cap carried thereby from the die and the pressure fluid, preferably compressed air, is then admitted through passages in the punch head to the inside of the cap rim to spread the rim and disengage its threads from the punch head. The cap may then be removed positively, if necessary, by means of suitable stripping devices moving relatively to the punch and conveniently engaging the edge of the cap rim which has been spread away from the punch head.

This operation permits of a particularly simple and therefore preferred embodiment in which a stationary bottomless die is used with a reciprocating punch the head of which passes entirely through the die on the forming stroke. The cap rim is then spread so that as the punch makes its return stroke, the edge of the rim engages the die and the cap is stripped off the punch head. The accompanying drawings illustrate this type of operation, together with apparatus particularly adapted thereto, but it is to be expressly understood that said drawings are for purposes of illustration only and are not to be construed as a definition of the limits of the invention, reference being had to the appended claims for this purpose.

In the drawings,

Fig. 1 is a sectional view of the apparatus;

Fig. 2 is a section through the punch on the line 2—2 in Fig. 1;

Fig. 3 is a side view of the punch head;

Fig. 4 is an enlarged sectional view of part of the punch head with a formed cap thereon; and

Fig. 5 is a perspective view of the completed cap.

The cap 1 may be made of paper board or cardboard which is sufficiently compressible to form a raised thread 2 on the inside of the rim 3. As shown in Fig. 5, this thread may be interrupted at 4 short of the edge of the cap rim and at 5 short of the top of the cap. The top of the cap may be provided if desired with a plurality of concentric corrugations 6, but these are not necessary. It will also be understood that the material of the cap and the form and length of the thread are matters of choice which is governed principally by the conditions of use in each case.

One of the caps is completed and discharged on each reciprocation of a punch 7 carried by a punch holder 8 which is reciprocated by any suitable means (not shown). In the form shown, the punch body 7, washer 9, and punch head 10 are assembled on the punch holder 8 by means of a bolt 11 extending through a central hole in the punch body and threaded at 12 into a boss 13 on the punch head, the other end of the bolt carrying a nut 14.

The punch cooperates with a bottomless circular die 15 of any suitable type. In the form shown, this die is secured by studs 16 in a die holder 17 which is mounted at 18 above a support 19. If it is desired to form the corrugations 6 in the cap, a circular member 20 having concentric raised corrugations 21 is located directly beneath the die opening.

The caps are formed from blanks positioned over the die opening, one being shown at 22. As the punch descends, the punch head 10 enters the die opening and the blank is formed around it into a cap. If the blank 22 is larger than required, as when a continuous strip of material is used, the washer 9 is made slightly larger than the punch head to pinch or cut off the extra material against the edge of the die opening. The punch head has a helical groove 23 of the desired pitch and length, into which the material of the cap is compressed (Fig. 4) as the punch moves into and through the die to form the thread 2. The punch carries the formed cap entirely through the die and against the bottom member 20 at the end of its stroke, the bottom of the punch head having concentric grooves 24 cooperating with the corrugations 21 of the bottom member 20.

For spreading the cap rim 3 and disengaging the thread 2 from the groove 23, a plurality of radial compressed air passages 25 open into the bottom of the groove at suitably spaced points. Each passage 25 communicates with a vertical passage 26 tapped into the punch head, the upper ends of these vertical passages opening into a circular distributing groove 26' formed in the top of the punch head. Compressed air is supplied to this groove at the proper time through aligned passages 27 and 28 in the washer 9 and punch body 7, respectively, and an air supply pipe 29 which may be flexible or otherwise suitably arranged to accommodate the reciprocating movement of the punch.

As the punch moves upward on its return stroke, the compressed air spreads the cap rim into the position shown in Fig. 1, disengaging the thread from the groove. If the cap is not blown off the punch by air pressure, it is carried up with the punch until the spread rim engages the bottom of the die as indicated in Fig. 1 and is thereby positively stripped off the punch head. The caps dropping in succession onto the member 20 may be removed in any suitable manner, as by means of intermittent jets of air from the pipe 30. The spread rims may be straightened if necessary by simply forcing the caps in a column or stack through a tube or the like having the diameter of the die opening.

The method and apparatus which have been particularly described above are preferred because of their great simplicity but complete reliability and effectiveness. The caps are formed and positively removed with a minimum of parts, moving or otherwise, while complicated and expensive mechanisms are entirely eliminated. These same advantages exist to a large degree in other types of operations performed with different apparatus, many of which variations will now occur to those skilled in the art, and it will also be understood that the invention is applicable broadly to the production of any cap-shaped article the rim portion of which projects into recesses in the surface of the forming element. Reference should therefore be had to the appended claims for a definition of the limits of the invention.

What is claimed is:

1. The method of forming a cap-shaped article having a threaded rim which comprises forming the article on the head of a punch by relative movement of the punch and a cooperating die, the punch head being grooved to form the thread and projecting through the die at the end of the forming stroke, then spreading the rim by outwardly directed fluid pressure to disengage the thread from the punch head, and then removing the article from the punch head by engagement of the spread rim with the die on relative movement of the punch and die in the opposite direction.

2. Apparatus for making cap-shaped articles comprising relatively movable punch and bottomless die members adapted to form an article from a blank of material, the punch head with the formed article thereon projecting through the die at the end of the forming stroke, said punch head having a recess into which a portion of the rim of the formed article projects and also having passages which open radially outward toward said rim, and means for supplying fluid pressure to said passages to spread said rim and disengage said portion from said recess, the spread rim engaging the die on relative movement of said members in the opposite direction to remove said article from the punch.

3. Apparatus for making cap-shaped articles with threaded rims comprising relatively movable punch and bottomless die members adapted to form an article from a blank of material, the punch head with the formed article thereon projecting through the die at the end of the forming stroke, said punch head having a substantially cylindrical surface with a helical groove therein and also having passages which open radially outward toward said rim, and means for supplying fluid pressure to said passages to spread said rim and disengage its thread from said groove, the spread rim engaging the die on relative movement of said members in the opposite direction to remove said article from the punch.

4. Apparatus for making cap-shaped articles with threaded rims comprising relatively movable punch and bottomless die members adapted to form an article from a blank of material, the punch head with the formed article thereon projecting through the die at the end of the forming stroke, said punch head being substantially cylindrical and having a helical groove the axial extent of which is less than the axial extent of the surface on which the rim is formed, said punch also having passages therein which open radially outward toward said rim, and means for supplying fluid pressure to said passages to spread said rim and disengage the thread thereof from said groove, the spread rim engaging the die on relative movement of said members in the opposite direction to remove said article from the punch.

5. Apparatus for making cap-shaped articles with threaded rims comprising relatively movable punch and bottomless die members adapted to form an article from a blank of material, the punch head with the formed article thereon projecting through the die at the end of the forming stroke, said punch head being substantially cylindrical and having a helical groove therein and also having passages which open into the bottom of said groove at spaced points, and means for supplying fluid pressure to said passages to spread the rim of said article and disengage its thread from said groove, the spread rim engaging the die on relative movement of said members in the opposite direction to remove said article from the punch.

ARTHUR F. STAGMEIER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,844,500	Dailey	Feb. 9, 1932
Re. 19,504	Moore	Mar. 19, 1935
2,039,626	Raiche	May 5, 1936
516,056	Jouet-Pastre	Mar. 6, 1894
2,120,903	Moore	June 14, 1938
2,272,920	Merta	Feb. 10, 1942