

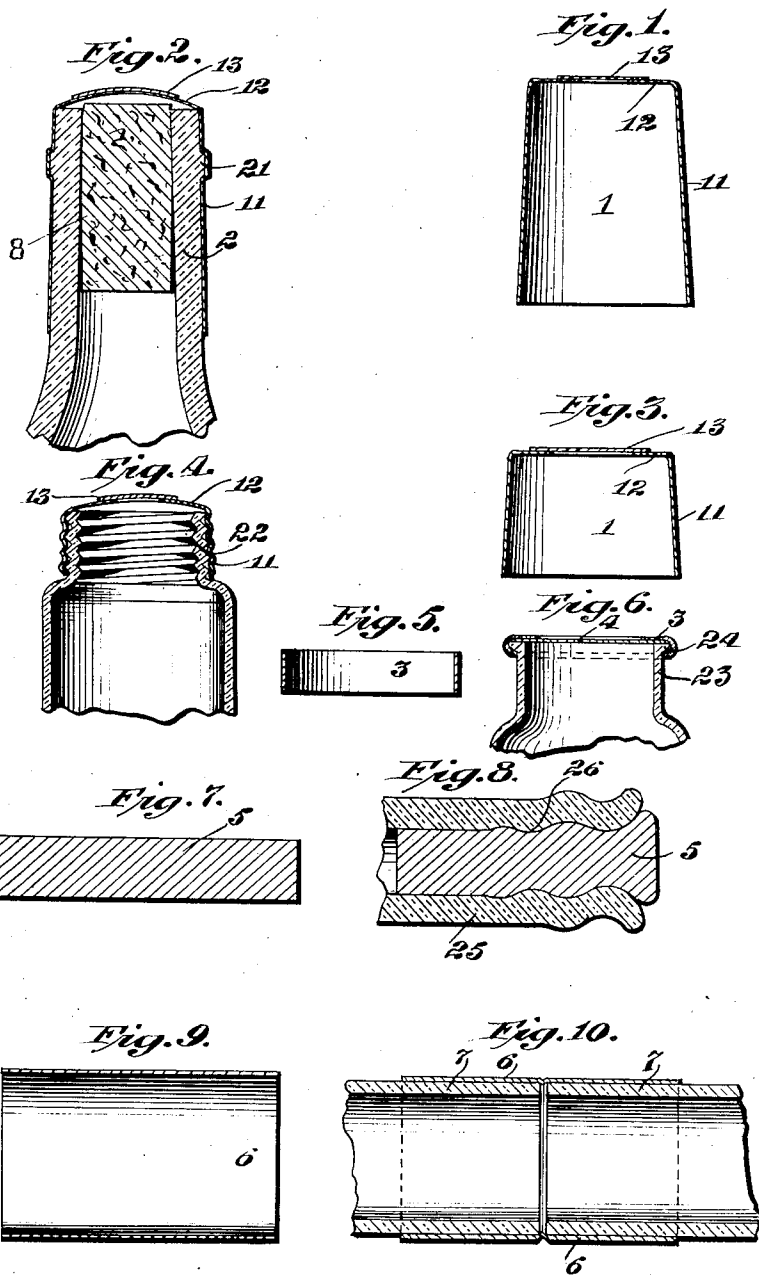
No. 825,116.

PATENTED JULY 3, 1906.

M. ENGELS.

PROCESS OF CLOSING OR SEALING APERTURES.

APPLICATION FILED JUNE 13, 1905.



Attest:  
*E. Mitchell*  
A. L. O'Brien

Inventor:  
MAX ENGELS  
by *Dickerson, Brown, Raegener & Binney*  
Attys.

# UNITED STATES PATENT OFFICE.

MAX ENGELS, OF DÜSSELDORF, GERMANY.

## PROCESS OF CLOSING OR SEALING APERTURES.

No. 825,116.

Specification of Letters Patent.

Patented July 3, 1906.

Application filed June 13, 1905. Serial No. 265,002.

*To all whom it may concern:*

Be it known that I, MAX ENGELS, a subject of the German Emperor, residing at 72 Parkstrasse, Düsseldorf, Germany, have invented certain new and useful Improvements in Processes of Closing or Sealing Apertures, of which the following is a specification.

My invention relates to the process of closing or sealing apertures by means of a cap, band, or joint protector made from a substance exemplified by celluloid in such a manner that it has the property of altering its dimensions under the influence of heat.

It may be used for the closing of bottles of various forms, for forming joints in tubes, or for many other purposes.

In the drawings, Figure 1 represents a bottle closure or cap shown in Fig. 2 as applied by means of my process to the sealing of a bottle. Fig. 3 represents a similar form of cap shown in Fig. 4 as applied to a bottle having a screw-threaded neck. Fig. 5 represents a tubular closure shown in Fig. 6 after it has been used to secure a disk over the neck-opening of a bottle. Fig. 7 represents a rod shown in Fig. 8 as expanded by my process to form an interior closure for a bottle. Fig. 9 represents a tube shown in Fig. 10 as forming a joint cover or protector for the two pieces of glass tubing.

Referring to Figs. 1 and 2, 1 designates a tubular closure, shown as a closed-end tube or cap formed from a tube of celluloid and having a flaring wall 11, formed with an inwardly-projecting annular flange 12 at its upper end, closed by a celluloid disk 13. 2 represents a bottle-neck having a bead 21. The cap 1 is produced by increasing the diameter of a tube of celluloid, so that initial strains are set up therein, the celluloid having the property of freeing itself from these strains under the action of heat, whereby it is caused to contract in diameter. It is applied to the bottle-neck 2, as shown in Fig. 2, by placing the cap 1 over the mouth of the bottle and exposing the same to heat, preferably in the form of steam or hot water. The cap 1 then shrinks to the form shown, tightly inclosing the neck of the bottle and forming an air-tight seal therefor. Owing to its ductility when heated, it adapts itself to rigidly inclose the bead 21 of the neck 2, whereby its accidental disengagement from the bottle-neck is prevented.

The form of tubular closure or cap shown in Fig. 3 is similar in design and construction to that shown in Fig. 1, except that the wall 11 is preferably somewhat shorter. It is applied in a similar manner to a bottle having its neck 22 formed with an external screw-thread. In shrinking it adapts itself to this screw-thread and when allowed to cool may be screwed from the bottle-neck 22 and replaced thereon as often as desired, forming a perfect substitute for the metal screw-threaded cap usually employed. Fig. 5 shows a tubular closure, shown as an open-end short tube 3, of celluloid, the wall of which may be made straight, as shown. As shown in Fig. 6, it is utilized by applying it to a bottle-neck 23, having an outturned bead 24, the mouth of the bottle being covered by a disk 4, which may be of metal or of any desired material. When the parts are assembled and exposed to heat as before, the short tube 3 contracts over the periphery of the disk 4 and beneath the bead 24, forming, with the disk 4, an efficient closure for a bottle.

Fig. 7 represents a rod 5, of celluloid, the diameter of which has been gradually decreased in the process of manufacture.

In Fig. 8 the rod 5 is shown as having been inserted in the bottle-neck 25, provided with interior corrugations 26. In this case the rod 5 when exposed to heat expands and fills the neck 25 of the bottle at all points for its entire length, forming an efficient closure therefor.

Fig. 9 designates a tubular closure shown as an open-end tube 6, of celluloid, which, as shown in Fig. 10, is employed to join two pieces of glass tube 7 7, placed end to end. Heat being applied as above described, the tube then contracts and firmly holds the pieces of tubing together, forming an air and liquid tight joint therebetween.

I have described the various closures shown as formed of celluloid, for the reason that this material has in a marked degree the property of relieving itself from initial strains set up during the process of manufacturing an article therefrom by the application of heat, so that it readily changes its diameter or desired dimension to fit either around or into any body to which it is applied.

I have illustrated various forms of my device not with the intention of limiting myself to the use of such forms, but, *per contra*, to show that my invention may be employed

for many purposes and embodied in diverse forms. I therefore in the claims employ the word "closure" in a broad sense to indicate either an interior or an exterior closure for  
5 an opening of definite size or an article adapted to join two or more parts, thereby acting as a closure for the gap between them, however small this may be. Thus, *e. g.*, it is evident that the insertion in the bottle-neck 2 of  
10 a cork 8, (shown in Fig. 2,) although this would ordinarily be unnecessary, would not render the cap 1 any less a closure.

In an application of even date herewith, which application has received Serial No.  
15 265,001, I have described and claimed the closure shown in the drawings and above explained, as well as the process of making the same. My present invention, therefore, refers only to the process of applying same to  
20 the bottle, tube, or other article which it is desired to close or seal.

Without specifying materials or enumerating equivalents, what I claim is—

1. The process of closing an aperture, which  
25 comprises applying to the article to be closed a closure of material under strain, and raising the temperature of the closure to a point at which it is relieved of such strain and is altered in dimension to fit the article to be  
30 closed.

2. The process of closing an aperture, which comprises applying to an article to be closed a tubular closure of material under circumferential strain, and raising the temperature  
35 of the closure to a point at which it is relieved

of such strain and is altered in diameter to fit the article to be closed.

3. The process of closing an aperture, which comprises applying to the exterior of an article to be closed a closure of material under  
40 circumferential strain, and of raising the temperature of the closure to a point at which it is relieved of such strain and is reduced in diameter to fit the article to be closed.

4. The process of closing a bottle, which  
45 comprises applying to the neck thereof a closure under circumferential strain, and of raising the temperature of such closure to a point at which it is relieved of such strain and is altered in diameter to fit said neck.  
50

5. The process of closing a bottle, which comprises applying to the exterior of the bottle-neck a tubular closure under circumferential strain, and raising the temperature of  
55 said closure to a point at which it is relieved of such strain and is reduced in diameter to inclose said neck.

6. The process of closing a bottle, which comprises applying over the mouth thereof a  
60 cap under circumferential strain, and of raising the temperature of said closure to a point at which it is relieved of such strain and is reduced in diameter to inclose the bottle-neck.

In testimony whereof I have signed this specification in the presence of two subscrib-  
65 ing witnesses.

MAX ENGELS.

Witnesses:

PETER LIEBER,

WILLIAM ESSENWEIN.