

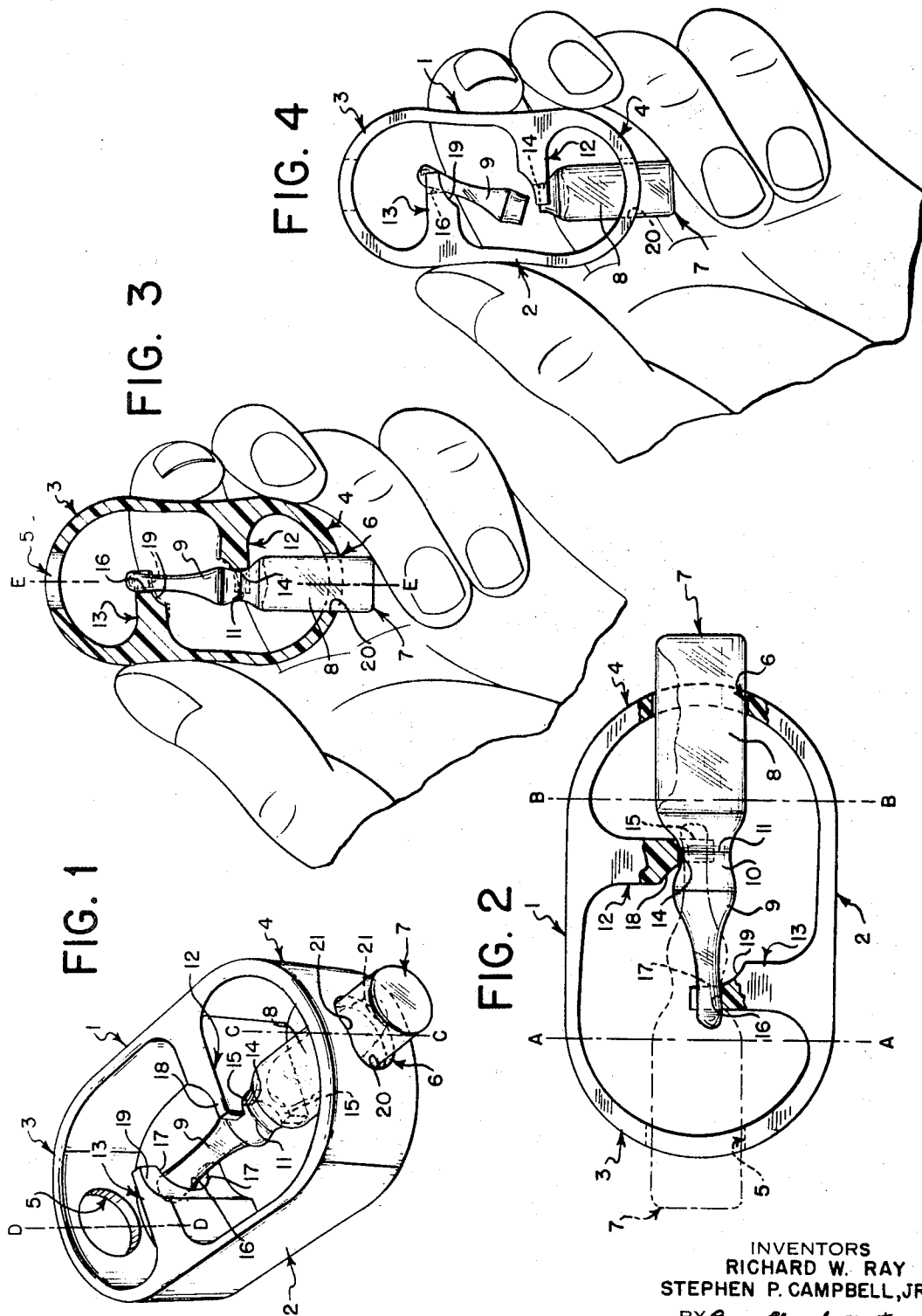
June 17, 1969

R. W. RAY ET AL

3,450,319

AMPOULE BREAKER

Filed March 16, 1967



INVENTORS
RICHARD W. RAY
STEPHEN P. CAMPBELL, JR.
BY *Penny, Elmonde, Morton,*
Taylor & Adams
ATTORNEYS

1

2

3,450,319

AMPOULE BREAKER

Richard W. Ray, Waltham, and Stephen P. Campbell, Jr.,
Brookline, Mass., assignors to Millipore Corporation,
Bedford, Mass., a corporation of Massachusetts

Filed Mar. 16, 1967, Ser. No. 623,573

Int. Cl. B26f 3/00; B02c 19/12

U.S. Cl. 225—104

8 Claims

ABSTRACT OF THE DISCLOSURE

An ampoule breaker for breaking an ampoule at a specified location intermediate its ends. The breaker includes two spaced leg members flexibly connected together at one end for receiving the ampoule in longitudinal alignment therebetween and ampoule engaging surfaces engaging against the ampoule on one side thereof at the specified location where it is to be broken and at two spaced locations on the diametrically opposite side of the ampoule offset longitudinally of the specified location.

BACKGROUND OF THE INVENTION

Field of the invention

This invention pertains to art of ampoule breaking devices and more particularly to an ampoule breaker for breaking an ampoule at the reduced neck portion thereof with a snapping action.

Description of the prior art

The typical ampoule is constructed of glass and comprises a body portion and tapered tip connected together by a neck portion of reduced cross-sectional dimension. The ampoule is hermetically sealed by melting the end of the glass tip and is designed for holding a quantity of liquid which may, for instance, be required for use in filling hypodermics and in connection with conducting laboratory experiments or tests or for any other similar purpose where it is convenient or necessary to have individual quantities of the liquid available. In order to dispense the liquid from the ampoule, the ampoule must be broken and this is usually effected by breaking through the neck which is prescored to facilitate breaking of the glass at the proper location. The actual breaking of the ampoule may be accomplished either by holding the ampoule between one's fingers and thumbs and applying lateral pressure against the tip or by using specially constructed breaking devices. Breaking of the ampoule does, however, present problems of contamination and spilling of the liquid and injury to the user.

Where the ampoule is manually broken by holding it in one's hands, contact with splintered glass or the ragged edges of the broken halves often causes cut fingers. Also, in manually breaking the ampoule, it is usually necessary to place one's thumbs at the scored neck and to apply finger pressure against the tip and body on the diametrically opposite side of the ampoule. This not only increases the chances of cutting one's thumbs but also produces a condition where the thumbs upon contacting the broken end of the body of the ampoule contaminate the liquid contained therein.

To avoid the problems associated with manual breaking of ampoules, ampoule breaking devices have been constructed in which the ampoule may be held. These devices may lessen the chances of injury to the person's fingers; but as conventionally constructed, present other disadvantages. For example, they are usually constructed with a guillotine type of blade arrangement for breaking through the neck of the ampoule with a severing action or are provided with a swinging hammer for knocking

against the tip of the ampoule to effect breaking. These types of breakers typically cause crushing of the glass at the point of breaking with the result that the crushed glass particles fall into the open end of the body and contaminate the liquid. Also, presently available breaking devices are generally complicated in construction with a number of separate parts being required to produce the device. This not only requires assembly of these parts during the manufacture of the devices but adds to their overall cost.

SUMMARY OF THE INVENTION

In accordance with the teachings of the present invention, there is provided an ampoule breaker which avoids the disadvantages associated with manual breaking as well as those characteristic of conventional breaking devices. With applicant's ampoule breaker, the person's fingers need not contact the ampoule at the point of breakage nor is the glass crushed during such breaking. Instead a clean break is effected and the broken tip readily falls clear of the body.

In construction, the ampoule breaker is made as a single piece structure from a suitable material such as plastic which is flexible in thin cross-sectional shapes but relatively rigid in thick cross-sectional shapes. The ampoule breaker generally comprises two spaced leg members flexibly connected together and provided with an opening for the reception of the ampoule. Each of the opposed leg members is provided with a rib extending toward the other leg member and terminating in an ampoule engaging surface. One of these surfaces engages against the neck of the ampoule on one side thereof while the other engages against the tip on the diametrically opposite side. In addition, the opening in the breaker includes its own ampoule engaging surface for engaging against the body of the ampoule so that one point of contact on one side of the ampoule is produced at the neck of the ampoule and two additional points of contact are made with the tip and body on the diametrically opposite side of the ampoule much in the same way as would occur where a person were to hold the ampoule between his fingers and thumbs to effect a breaking at the neck with a snapping action.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the ampoule breaker of the present invention;

FIG. 2 is a side elevation of the ampoule breaker with an ampoule received therein preparatory to breaking;

FIG. 3 is a cross-sectional view of the ampoule breaker showing the position of the ampoule therein immediately prior to breaking; and

FIG. 4 is a side elevation showing the ampoule breaker and ampoule immediately after a breaking of the ampoule has been effected.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the accompanying drawings, the ampoule breaker constructed in accordance with the teachings of the present invention is a single piece structure and includes first and second leg members 1 and 2 which are connected together at their ends by integrally formed end members 3 and 4. The lines of demarcation between the leg members and the end members are shown in FIG. 2 by the dotted lines A—A and B—B. The members 3 and 4 include openings 5 and 6, respectively, extending there-through for the reception of an ampoule 7. The ampoule itself includes a body 8 and tapered tip 9 connected together by a neck 10 which is scored as shown at 11 to facilitate breaking; and as indicated by both the solid and dotted outline of an ampoule 7, insertion into the

ampoule breaker may be advantageously effected through either of the openings 5 or 6.

For purposes of holding the ampoule in position within the breaker preparatory to breaking, a first rib 12 is integrally formed with the first leg member 1 while a second rib 13 is integrally formed with the second leg member 2. The first rib extends laterally across the first leg member 1 and toward the second leg member and terminates in an ampoule engaging surface 14 and associated side surfaces 15. The second rib 13 is similarly oriented on the second leg member 2 and terminates in a second ampoule engaging surface 16 and associated side surfaces 17.

The surfaces 14 and 15 of the rib 12 are adapted to engage the neck of the ampoule when inserted through the opening 6 with the surface 14 engaging against the upper side of the ampoule as seen in FIG. 2 and the side surfaces 15 against the lateral sides to retain the ampoule in longitudinal alignment with the leg members. Also, with the ampoule inserted through the opening 6, the surface 16 of the rib 13 engages against the tip of the ampoule on its lower side as viewed in FIG. 2, that is, on the diametrically opposite side of the ampoule from the location of engagement between the neck and the first engaging surface 14 of the rib 12. It will be apparent from FIG. 2 that when the ampoule is inserted through the opening 5 instead of the opening 6, the neck rests on the engaging surface 16 of the rib 13 and the tip on the engaging surface 14 of the rib 12; and to permit this reverse arrangement, the ribs 12 and 13 are advantageously spaced at equal distances from the openings 6 and 5, respectively. In addition, to facilitate guiding of the ampoule into proper opposed position relative to either one of the ribs 12 or 13, their facing sides are constructed with curved guiding surfaces 18 and 19, respectively, against which the forward tip of the ampoule may slide.

In accordance with the teachings of the present invention, the ampoule breaker is constructed with certain portions which are flexible and other portions which are generally rigid. In particular, the two end members 3 and 4 are constructed so as to flex upon pressure being exerted on the outer sides of the leg members 1 and 2 in a direction tending to force the leg members toward each other. For this purpose, the entire breaker is made of plastic or other similar material having normal flexible properties where relatively thin or small in cross section. As shown in FIG. 1, the cross-sectional dimension of the end members in the areas to each side of the openings 5 and 6 is quite small thus permitting flexing at these locations about the axes designated by the lines C—C and D—D.

In addition to the end members, the portion of the leg member 1 disposed opposite the rib 13 and the portion of the leg member 2 disposed opposite the rib 12 are each constructed with a reduced cross-sectional thickness so as to permit flexing as shown in FIG. 4. The ribs themselves, however, as well as the remaining portions of the leg members are thick enough to be rigid. This construction aids in producing a clean breaking of the ampoule as more fully described below.

To break an ampoule, the breaker is used as follows. First, the ampoule is inserted through one of the openings 5 or 6. With reference to FIGS. 3 and 4, the opening 6 is used for purposes of explanation. As the ampoule is inserted, the forward tip rides along the curved guiding surface 19 of the rib 13 and the bulbous part of the tip passes by the surfaces 14 and 15 of the rib 12 until the ampoule is seated with the neck in opposed relationship relative to the rib 13. The flexibility of the end members and the localized portions of the leg members permit the leg members to spread apart slightly, if necessary, as the bulbous part of the tip is directed past the rib 12. The surfaces 14, 15 of the rib 12 as seen from FIG. 1 are complementary in shape to the semi-circular shape of the neck of the ampoule and thus the rib 12

acts as a stop against which the body portion of the ampoule abuts to limit its inward movement through the opening 6. Also, the rib 12 serves to hold the ampoule in place once it is inserted into the position shown in FIG. 1 by its close engagement with the neck of the ampoule.

With the ampoule in place, the breaker may be conveniently held in one hand with the ampoule in an upright position and with one or more fingers of the hand engaging against the outer surface of one of the leg members and the thumb against the outer surface of the other leg member as shown in FIG. 3. The leg members are then squeezed toward each other; and as this squeezing action is commenced, the rib 12 presses the tip of the ampoule into firm engagement with the engaging surface 16 of the rib 13 and the body of the ampoule against the wall portion 20 of the opening 6 which faces in the same direction as the surface 16. The wall portion 20 of the opening 6 thus acts as a third ampoule engaging surface for cooperating with the ampoule engaging surfaces of the ribs 12 and 13; and as is evident from FIG. 1, the side portions 21 of the wall surface of the opening 6 define side surfaces preventing sideways movement of the ampoule.

The position of the leg members and ribs of the breaker relative to the ampoule as the squeezing action is commenced is shown in FIG. 3. Due to the construction of the breaker and in particular the orientation of the flexible and rigid portions, the squeezing of the leg members together causes the ribs to move not only toward the opposed leg members but in a direction away from each other as measured along the longitudinal axis E—E of the breaker. This movement is shown in FIG. 3 where the dotted lines represent the normal position of the ribs before squeezing is commenced. This movement of the ribs acts against the tip and body of the ampoule tending to move them in opposite directions along the longitudinal axis of the breaker; and such movement becomes more pronounced as the squeezing of the leg members continues and a breakage at the neck is effected as best shown in FIG. 4.

The actual breaking of the ampoule is produced by the pressure exerted on the neck by the engaging surface 14 of the rib 12 on one side of the ampoule and by the pressure exerted on the diametrically opposite side of the ampoule by the engaging surface 16 of the rib 13 against the tip of the ampoule and the engaging surface 20 of the wall portion of the opening 6 against the body. This breaking action produces a clean break at the neck without crushing of the glass much in the same way as the ampoule would be broken by holding it between the fingers and thumbs of one's hands. In addition, the spreading of the ribs away from each other assists in assuring that the tip and body separate from each other as breakage occurs to prevent the broken edges from rubbing against each other and thereby causing crushing of the glass.

The above description of the present invention has been made with reference to the presently preferred embodiment of the breaker; however, it is to be understood that various changes thereto may be made without departing from the scope of the invention as set forth in the following claims.

What is claimed is:

1. An ampoule breaker for use with an elongated ampoule having a body and a tip connected by a neck for separating the tip from the body by breaking through the neck thereof, said breaker comprising:

- (a) spaced first and second leg members flexibly connected together at one end thereof;
- (b) an opening extending between the other ends of said leg members for receiving said ampoule with the longitudinal axis of said ampoule extending along the longitudinal axis of said leg members and with the tip, neck and a portion of the body disposed therebetween;

5

6

- (c) a first rib extending from said first leg member toward said second leg member and terminating in a first ampoule engaging surface for engaging against one side of said ampoule at the neck thereof;
- (d) a second rib extending from said second leg member toward said first leg member at a location offset longitudinally along said leg members from said first rib and terminating in a second ampoule engaging surface for engaging against the tip of said ampoule on the other side thereof diametrically opposite to the location of engagement between the neck of the ampoule and the first ampoule engaging surface of said first rib; and
- (e) a third ampoule engaging surface defined by a portion of the wall surface of said opening and facing in the same direction as said second ampoule engaging surface at a location offset longitudinally along said leg members from said first rib on the side thereof opposite said second rib for engaging against the body of said ampoule on said other side thereof.
2. An ampoule breaker according to claim 1 wherein:
- (a) each of said ampoule engaging surfaces extend laterally to the longitudinal axis of said leg members; and
- (b) at least two of said ampoule engaging surfaces include side retaining surfaces disposed in the plane of the engaging surfaces and facing laterally thereof for engaging the sides of said ampoule intermediate the sides which engage against the engaging surfaces to retain said ampoule in longitudinal alignment with said leg members.
3. An ampoule breaker for use with an elongated glass ampoule having a body and a tapered tip connected by a scored neck of reduced cross-sectional dimension for separating the tip from the body by breaking through the neck thereof, said breaker comprising:
- (a) spaced first and second leg members extending generally parallel to each other and connected at their ends by curved flexible members formed integrally therewith;
- (b) an opening extending through at least one of said curved flexible members intermediate said leg members for receiving said ampoule in longitudinal alignment with said leg members with the tip, neck and a portion of said body disposed therebetween;
- (c) a first rib formed integrally with said first leg member intermediate said flexible members and extending laterally thereacross and toward said second leg member and terminating in a first ampoule engaging surface for engaging against one side of said ampoule at the neck thereof;
- (d) a second rib formed integrally with said second leg member intermediate said flexible members and extending laterally thereacross and toward said first leg member at a location offset longitudinally along said leg members from said first rib and terminating in a second ampoule engaging surface for engaging against the tip of said ampoule on the other side thereof diametrically opposite to the location of engagement between the neck of the ampoule and the first ampoule engaging surface of said first rib; and

- (e) a third ampoule engaging surface defined by a portion of the wall surface of the opening in said flexible member and facing in the same direction as said second ampoule engaging surface for engaging against the body of said ampoule on said other side thereof.
4. An ampoule breaker according to claim 3 wherein:
- (a) each of said flexible members are provided with an opening extending therethrough for the insertion of an ampoule; and
- (b) the spacing of said first rib member from the opening in one of said flexible members is the same as the spacing of said second rib member from the opening in the other of said flexible members whereby said ampoule may be inserted through either of said openings with the neck, tip and body of said ampoule in engagement with said first, second and third ampoule engaging surfaces, respectively.
5. An ampoule breaker according to claim 4 for use with an ampoule having a circular cross section at any point along its length wherein:
- (a) each of said ampoule engaging surfaces includes side retaining surfaces, which together with said ampoule engaging surfaces thereof are semi-circular in shape, for retaining said ampoule in longitudinal alignment with said leg members.
6. An ampoule breaker according to claim 5 wherein:
- (a) each of said first and second ampoule engaging surfaces and associated side retaining surfaces are complementary in shape to the semi-circular shape of the neck of said ampoule.
7. An ampoule breaker according to claim 6 wherein:
- (a) the portions of said first and second leg members disposed opposite said second and first ribs, respectively, are flexible in construction;
- (b) the remaining portions of said leg members are rigid in construction; and
- (c) said first and second ribs are rigid in construction.
8. An ampoule breaker according to claim 7 wherein:
- (a) the sides of said ribs facing each other are each provided with curved guiding surfaces for guiding the tip of said ampoule into opposed relationship with the ampoule engaging surface thereof.

References Cited

UNITED STATES PATENTS

2,147,394	2/1939	Austern	241—169
2,359,644	10/1944	Hoey.	
2,425,093	8/1947	Fosler.	
2,488,956	11/1949	Yeskett.	
2,503,517	4/1950	Sirica.	
2,507,097	5/1950	Fields.	
2,507,187	5/1950	Terry	51—205
2,515,020	7/1950	Scott.	

LESTER M. SWINGLE, *Primary Examiner.*JAMES F. McKEOWN, *Assistant Examiner.*

U.S. Cl. X.R.

241—99