Sept. 2, 1969 LEROY H. ROHDE 3,464,576

TAMPER-PROOF CONTAINER CLOSURE

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FIG. 1.

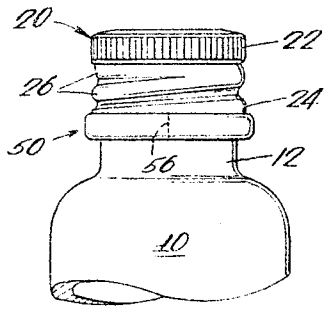

FIG. 2.

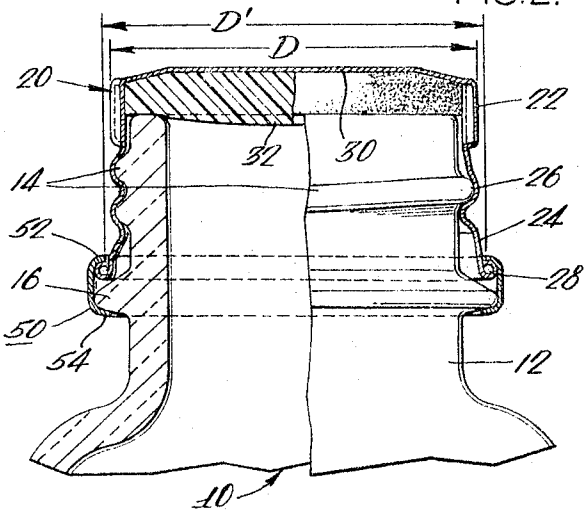

FIG. 3.

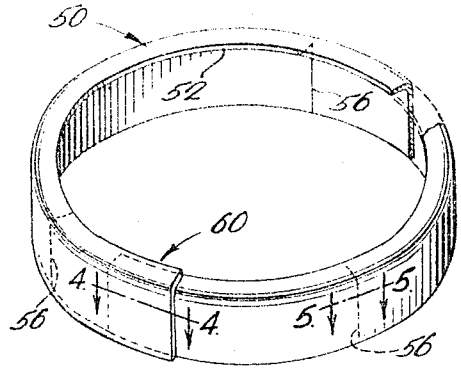

FIG. 4.

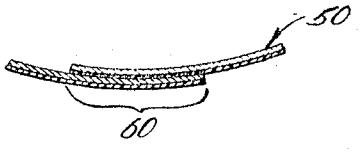

FIG. 5.

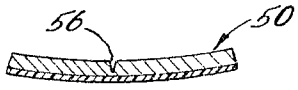

FIG. 6.

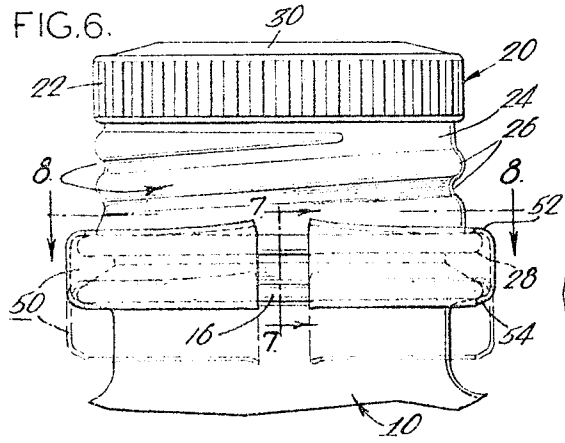

FIG. 7.

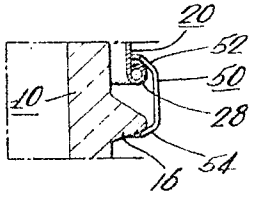

FIG. 8.

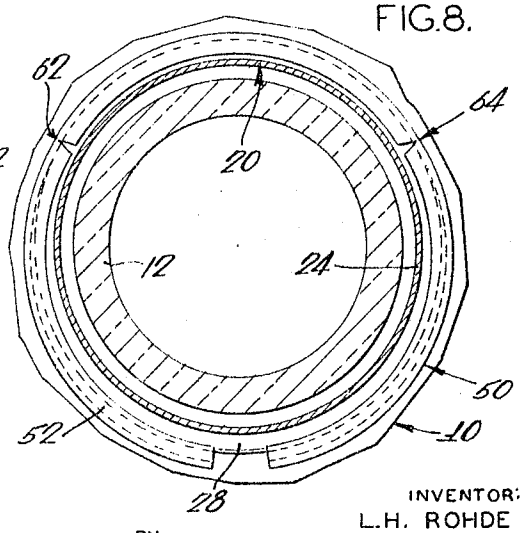

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FIG. 9.

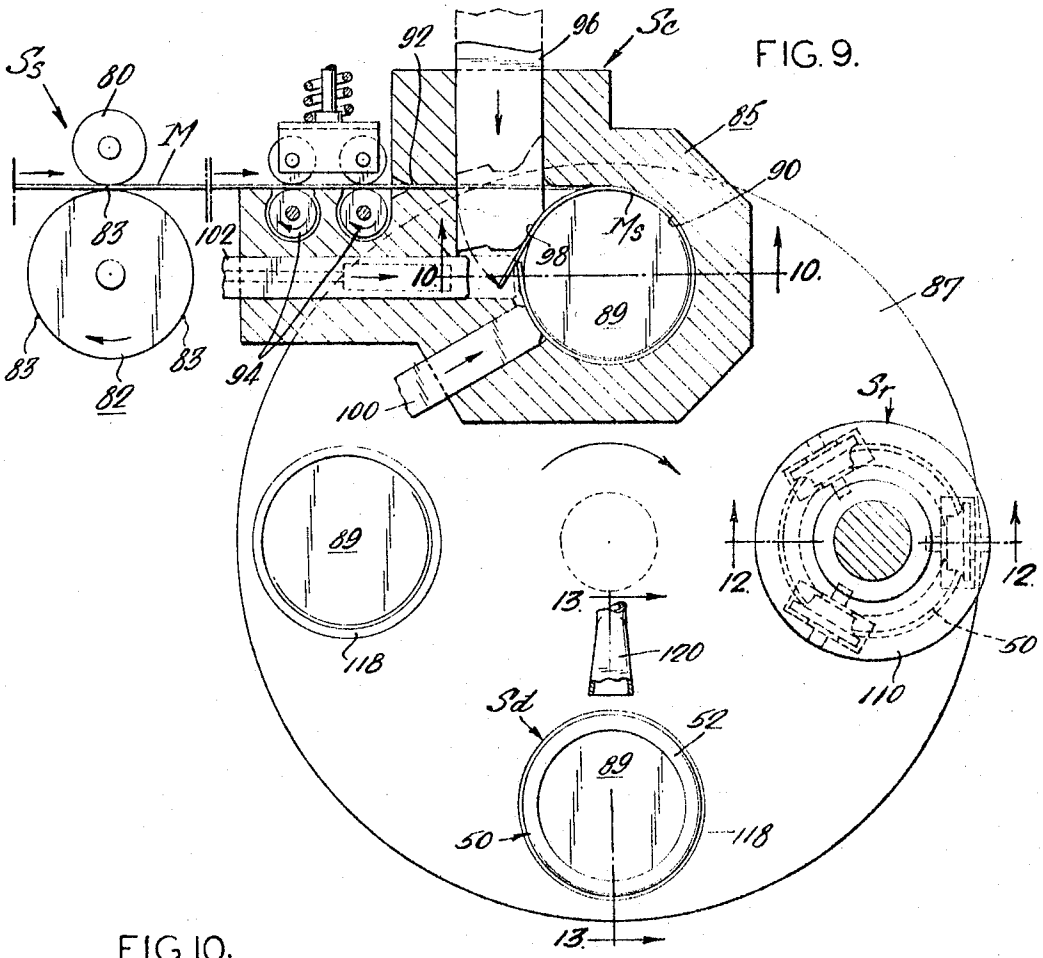
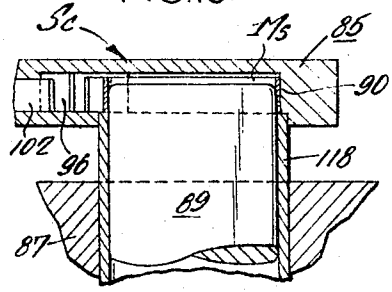


FIG. 10.



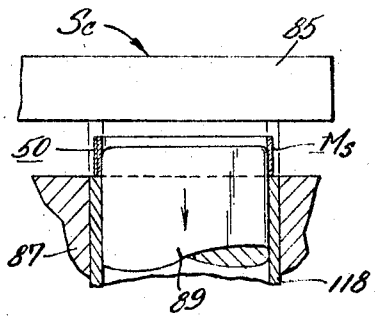


FIG. 11.

FIG. 12.

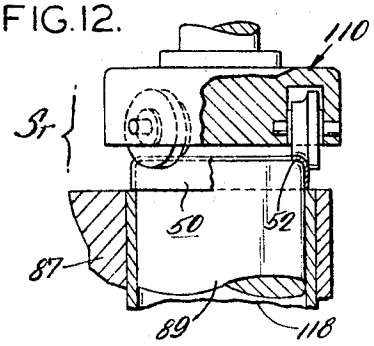


FIG. 13.

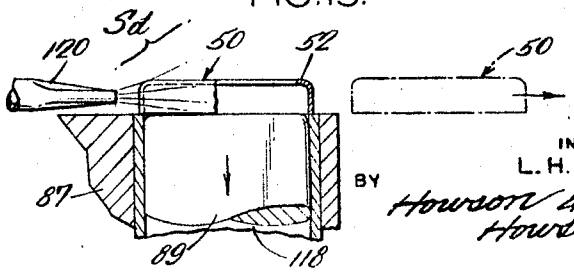


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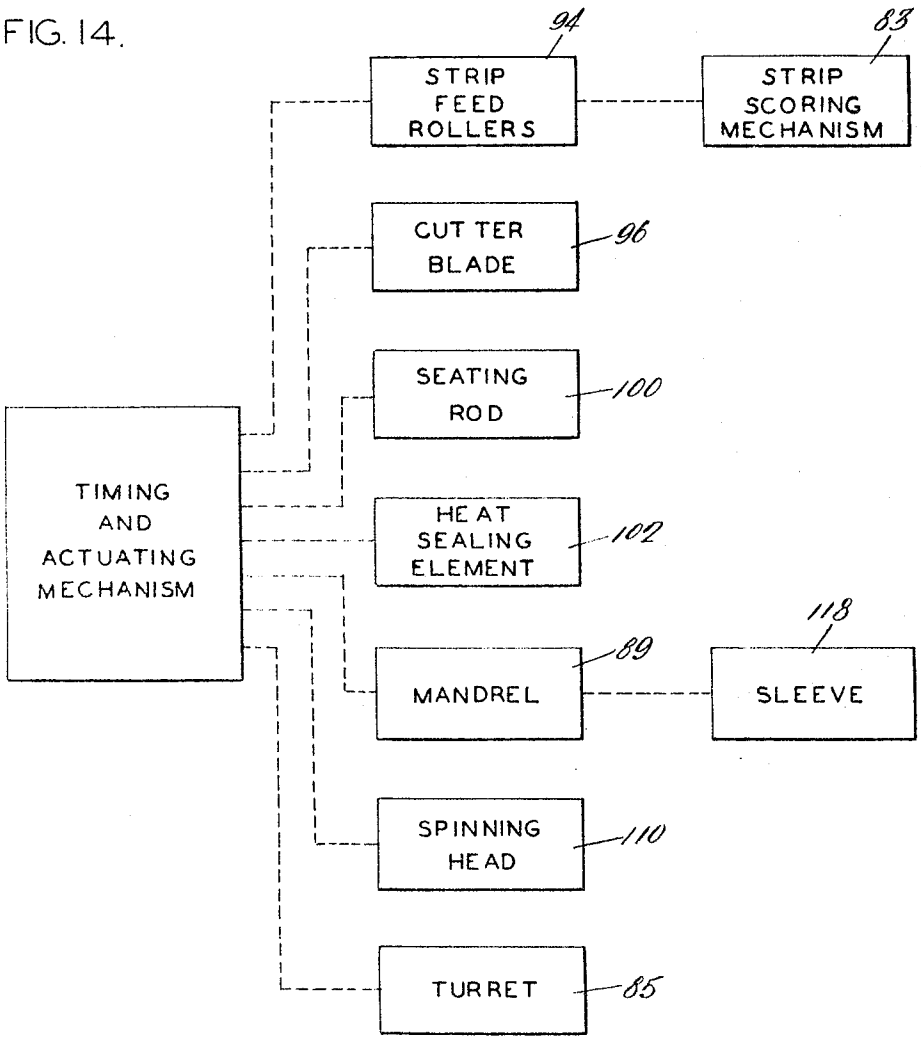
FIG. 14.



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United States Patent Office

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TAMPER-PROOF CONTAINER CLOSURE

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Int. Cl. B65d *41/34, 45/30*

U.S. Cl. 215—42 9 Claims

ABSTRACT OF THE DISCLOSURE

A tamper-proof ring for securing a closure over the open end of a container having a radial projection which lies closely adjacent the lower terminal edge of the closure when it is fully seated on the container in the closed position. The ring comprises a generally cylindrical sidewall, a radially inwardly projecting circumferentially extending upper flange engaging over a bead on the closure and a radially inwardly projecting circumferentially extending lower flange seating under the projection on the container and means defining at least one axial score line extending the entire width of the ring whereby upon movement of the closure in a direction to remove it from the container the ring fractures along said score line.

The present invention relates to container closures and more particularly to a truly tamper-proof closure.

The present invention relates particularly to closures for containers wherein it is desirable and necessary to seal the contents in the container until ready for use by the ultimate consumer, and wherein it is desirable to have some evidence of tampering if the closure is opened prematurely. In some instances, tear caps have been proposed as a solution to this tampering problem. However, this type of closure is not satisfactory in all circumstances especially where it is desired to re-close the container or bottle from time to time after periodic withdrawal of some of the contents thereof.

More particularly, the present invention relates to a means for tamperproofing container-closure combinations wherein the closure is in the form of a conventional screw cap. In some cases a band of resilient material such as plastic is tightly applied over the screw cap and the container, such as a bottle, covering the lower terminal edge of the cap. This arrangement has certain disadvantages and drawbacks. For example, it has been found that to provide an effective seal, the band must be tightly applied and thus, it is very difficult to remove.

Often the band can only be removed by using a sharp instrument such as a knife or the like. This is an awkward, clumsy means for opening a bottle and sometimes results in injury to the user. Furthermore, if the band is not applied very tightly, the screw cap may be removed and replaced without fracturing or breaking the band and thus, this arrangement is not truly tamperproof under all conditions.

Moreover, the tear-off caps and these plastic bands require complicated and expensive equipment to apply to the container.

With the foregoing in mind, an object of the present invention is to provide a means for truly tamperproofing closures for containers where it is desirable to reuse the closure several times after it has once been removed from the container. The invention relates particularly to a tamper-proof ring for use with the screw type caps used on containers such as bottles storing pharmaceuticals and the like. These caps usually comprise an annular top having a crown portion to be grasped by the user to turn the same, a depending side wall or skirt having spiral screw threads therein to engage with complementary screw

threads on the neck of a container and an annular bead at the lower edge of the skirt which projects radially outwardly slightly beyond the circumferential trace of the crown of the cap.

In accordance with the present invention, a tamper-proof ring is provided which has a plurality of circumferentially spaced axial score lines, an upper inwardly directed radial flange adapted to engage over the bead on the lower edge of the skirt of the cap and a lower radially inwardly directed flange which engages under a radial projection on the bottle. The radial projection is selectively located on the nick of the container so that when the cap is seated completely in the closed position, the bead and radial projection are closely adjacent each other and the flanges of the retaining ring snugly embrace the bead and the lower edge of the radial projection.

Now when it is desired to remove the cap, the user simply grips the crown and turns the cap in a direction to displace it upwardly threby effecting relative displacement of the bead and the radial projection causing a stress on the ring and ultimate separation thereof along one of the score lines, one of the other non-fractured score lines providing a hinge so that the ring may be completely removed from the container and discarded.

Thus, it is readily apparent that the present invention provides a means for truly tamperproofing container closures of the screw cap type used on containers such as pharmaceutical bottles.

For example, whenever it is attempted to open the container, the ring will fracture and it is impossible to reseal it thereby giving visual evidence that the cap has been once removed. It is equally clear that the cap may not be removed without fracturing the retaining ring. Furthermore, this tamper-proof ring is easy to apply to the container closure combination and is relatively simple to remove and obviously does not require any sharp instruments such as a knife.

The present invention is also directed to a novel method for making a tamper-proof ring of the above type so that it may be mass produced very economically. In accordance with the present invention, the tamper-proof ring may be manufactured from a metallic strip of material which is scored at a plurality of spaced locations and then bent to a circular shape with the ends in overlapping relation. Thereafter, the overlapped ends are joined for example by welding and one of the radially inwardly projecting flanges formed on the ring, for example by a rolling operation. The ring in this form is then ready to be applied to a container closure in the manner described above. In the present instance one face of the strip material may be coated with a suitable layer of material which will form a bond at the overlapping ends upon application of heat and/or pressure.

Considering now more specifically the system illustrated in the drawings for carrying out the method of the present invention, a strip material may be supplied from a suitable roll through the nip of a pair of rollers at a feeding station, one of the rollers having a plurality of scoring blades at spaced locations about its periphery to apply the spaced score lines in the strip upon movement of the strip through the feeding station. Thereafter the scored strip is guided into a circular opening of a workhead around one of a plurality of mandrels which are selectively actuatable relative to the workhead. When a predetermined length of the strip material is formed around the mandrel to the workhead, the strip is cut and the overlapping ends joined at the assembly station. Thereafter the mandrel, which is one of a plurality on a rotating turret, moves the ring-like strip material out of the assembly station to a first rolling station wherein the flange is applied to the ring. Thereafter, the turret rotates to a

discharge station where the first ring is discharged to a suitable accumulation area. It is noted that upon rotation of the turret and movement of the mandrels through the successive stations, the strip material is being continuously formed into a ring at the assembly station, rolled, and discharged from the turret at the discharge station. This system provides a high speed, very efficient means for making tamper-proof rings in accordance with the present invention.

With the foregoing in mind, an object of the present invention is to provide a means for truly tamperproofing container closure combinations.

Another object of the present invention is to provide a truly tamper-proof closure for containers which is of relatively simplified construction and which is effective for the purposes intended, that is, to provide visual indication to show when the closure has been once removed from the container.

Still another object is to provide a tamper-proof closure for containers which is easy and economical to make and fully effective for the purposes intended.

A still further object of the present invention is to provide a simple and effective method for making these tamper-proof closures.

These and other objects of the present invention and various features and details thereof and the method of making the same are hereinafter more fully set forth with reference to the accompanying drawings, wherein:

FIG. 1 is a side elevational view of a container closure combination embodying a tamper-proof ring in accordance with the present invention;

FIG. 2 is an enlarged sectional view taken through the cap and container;

FIG. 3 is a fragmentary perspective view of the tamper-proof ring;

FIG. 4 is an enlarged fragmentary sectional view taken on line 4—4 of FIG. 3;

FIG. 5 is a still further enlarged fragmentary sectional view taken on line 5—5 of FIG. 3;

FIG. 6 is an enlarged side elevational view of the cap and a part of the bottle showing the cap partially removed and the retaining ring fractured;

FIGS. 7 and 8 are enlarged sectional views taken on lines 7—7 and 8—8 of FIG. 6;

FIG. 9 is a plan view illustrating schematically apparatus for making a tamper-proof ring in accordance with the present invention;

FIG. 10 is a sectional view taken on line 10—10 of FIG. 9 with the mandrel in an upper or extended position;

FIG. 11 is a view similar to FIG. 10 at the cutting and sealing station with the mandrel lowered to withdraw the ring from the station;

FIGS. 12 and 13 are enlarged views taken on lines 12—12 and 13—13 at the rolling and removal stations of the apparatus respectively; and

FIG. 14 is a schematic view illustrating the various elements of the system connected to the timing and actuating mechanism.

Referring now to the drawings, and particularly to FIGS. 1 and 2 thereof, there is shown a tamper-proof ring in accordance with the present invention on a container-closure combination, the container **10**, in the present instance, being in the form of a bottle or the like having a reduced neck portion **12** with a spiral thread **14** or other similar locking means formed thereon. As best illustrated, the end of the bottle has an annular radially outwardly projecting flange or finish **16** spaced below the threads **14**.

The closure is in the form of a cap **20** having a disc-like top **22**, a skirt **24** depending from the top having threads **26** formed therein so that it may be turned on to the bottle, the lower edge of the skirt **24** being rolled to form a bead **28**. The top of the cap may be generally crown shaped as indicated at **30** and knurled about its periphery to facilitate gripping of the cap by the user. Additionally, a sealing member **32** may be provided in the crown portion of the cap to seat against the top of the bottle and seal the container when the cap is applied thereto.

In accordance with the present invention there is provided a novel arrangement for tamperproofing the cap to give a visual indication that it has been opened and the seal between the cap and bottle broken. In the present instance, the tamper-proof member is in the form of an annular member or ring generally designated by the numeral **50** having upper and lower radially inwardly projecting flanges **52** and **54** respectively. The upper flange **52** seats on and engages over the bead **28** of the cap **20** and the lower flange **54** snugly engages under the radial projection **16** on the neck of the container. To this end the maximum diameter D of the crown **30** is less than the diameter D' of the inner peripheral edge of the flange **52**. The ring **50** is provided with at least one and preferably several circumferentially spaced axially extending score lines **56**. As shown in the drawings the score lines **56** define an area of reduced thickness in the ring extending the entire width of the ring between the upper and lower flanges. These score lines **56** provided weakened fracturable areas in the ring which, as explained in more detail below, separate upon removal of the cap. As illustrated in FIG. 3, the ring **50** in the present instance, is not continuous and may be formed from a flat strip of material which is bent to circular shape having overlapped ends as at **60** joined together by means of a weld. In the present instance, to facilitate joining of the ends of the strip forming the ring, the outer surface thereof is coated with a layer **51** of bonding material which welds upon application of pressure and/or heat. A suitable bonding material is a thermo or pressure sensitive adhesive.

Consider now briefly the assembly of a container closure incorporating a tamper-proof ring in accordance with the present invention. The cap prior to assembly to a bottle usually has a straight-sided, generally cylindrical skirt and is usually applied to a filled bottle in automatic capping apparatus wherein the sidewall is rolled to produce threads **26** conforming to the threads **14** on the bottle **10**. The next step after application of the cap in the present instance, would be to assemble the tamper-proof ring **50** over the cap. Accordingly, the ring is initially in the form illustrated in FIG. 3 wherein only the upper flange **52** is formed and the depending sidewall is straight. The ring in this form is then positioned over the cap on the containers so that the upper flange **52** seats on the bead **28**. In this position the lower edge of the sidewall of the ring **50** is rolled under the finish on the bottle (see FIG. 2).

It is noted that if desired the cap and ring may be rolled simultaneously to form the threads **26** in the cap and the lower flange **54** on the ring.

Now when it is desired to remove the cap **20** from the bottle **10**, the user simply supports the bottle **10** in one hand and grips the crown **30** of the cap with the other hand and turns the cap in the direction to remove it from the bottle. This turning action displaces the cap **20** axially and exerts a prying force in opposite directions on the flanges **52** and **54** which creates a circumferential force causing separation of the ring at one of its weakest points, that is, along one of the score lines **56**. As illustrated for example in FIG. 8, continued upward turning of the cap divides the ring into sections which pivot at the scored areas as at **62** and **64** to facilitate easy removal of the ring.

Even though the tamper-proof ring of the present invention is illustrated and described in connection with a cap made of metal, such as aluminum, it is to be understood that the principle of the invention can be applied to other types of caps, for example plastic screw type caps.

The present invention is also directed to a method of making a tamper-proof ring. In accordance with this method, the ring may be formed from a continuous strip

of thin gauge strip material which is suitably scored at a plurality of spaced apart locations and then cut at intervals to form short strips which are then bent to a circular shape. The ends of the short strip are then overlapped and suitably secured together by means of a weld. In the present instance, the strip may be coated on one surface, the coating being of a suitable bonding material so that it will bond to metal by application of heat and/or pressure, thereby facilitating assembly of the overlapping ends at the welding station. Thereafter, the ring now in a circular form is then rolled along one terminal edge to form one of the flanges, in the present instance the upper flange. The ring is now ready for assembly to a container closure in the manner described above.

There is illustrated in FIGS. 9–13 inclusive system and apparatus for continuously forming rings by the method described above. This apparatus, which is illustrated schematically includes a scoring station S_s consisting in the present instance of a pair of cooperating rolls **80** and **82**, one of which is in the form of a scoring wheel having a plurality of scoring blades or elements **83** on its outer periphery at circumferentially spaced locations. The strip material M is fed continuously from a supply roll through the nip of these two rolls whereby, as illustrated in FIG. 9, one face of the strip is scored transversely to the direction of movement of the strip. The scored strip then passes from the scoring station S_s to a cutting and sealing station S_c where the scored strip M is cut to predetermined lengths to provide strip segments M_s which are bent to circular shape and joined at overlapping ends. The cutting and sealing station S_c includes a workhead **85** overlying a turret **87** carrying a plurality of mandrels **89** which are indexed to move through various other stations to complete formation of the ring.

At the cutting and sealing station S_c, a mandrel **89** is in an extended position as shown in FIG. 10 and engages through an opening **90** in the stationary workhead **85**. The workhead **85** has a slotted guide opening **92** through which the strip material M is fed, being guided therethrough by strip feed roller assembly **94**. As the strip material M passes through the slotted opening **92**, it engages the outer periphery of the circular opening **90** in the workhead, wraps around the mandrel **89** and when a pre-selected length to form a ring of a given size has been fed to the cutting and sealing station S_c, a reciprocating cutter **96** is actuated to cut the strip material. The cutter **96** is mounted for reciprocating movement in a direction transverse to the direction of feed of the strip material and has an arcuate side edge portion **98** which seats one end of the strip segment M_s against the mandrel (see FIG. 9). Before the cutter **96** reaches its fully extended position, a seating rod **100** which is normally biased to a retracted position and which may be synchronized with the cutter, is actuated to an inner position to press the other end of the strip segment M_s against the mandrel **89** so that the ends of the strip are in overlying relation when the cutter is in its fully extended position. Thereafter the overlapping ends of the strip are fused together in the present instance by means of a heating element **102** mounted in the workhead whose movement may be synchronized with the seating element **100** and cutter **96** to seal the ends of the strip. As noted above the strip has at least one surface coated with a layer of bonding material such as a thermo or pressure adhesive to permit joining of the ends of the strip segment M_s by application of heat and/or pressure. After a predetermined time has elapsed to permit fusing the ends of the strip, the heating element **102**, seating element **100** and cutter **96** are retracted and the mandrel **89** with the ring positioned on the upper end thereof is lowered to the position shown in FIG. 11. The turret **87** is then rotated to convey the ring to the rolling station S_r and the next adjacent mandrel is positioned in the opening in the workhead to receive another segment of strip material. At the rolling station, rolling mechanism **110** engages the upper peripheral edge of the ring and presses it over the upper portion of the mandrel to form the upper annular flange of the ring as shown in FIG. 12.

As shown in FIGS. 10–13 inclusive, a cylindrical sleeve **118** circumscribes each of the mandrels **89** and is adapted for axial movement between an extended position shown in FIG. 10 to support the strip segment at the forming and cutting station S_c and a retracted position shown in FIG. 11 wherein the top edge thereof is flush with the upper face of the turret. In this position of the sleeve **118** the partially finished ring is supported in proper position for rolling. It is noted that the sleeve **118** and mandrel are movable axially relative to one another and suitable means are provided for this purpose to permit retraction of the mandrel in the sleeve at the discharge station as shown in FIG. 13. Simultaneously with formation of the flange on the ring at the rolling station S_r, another segment of strip material is being formed into a partially finished ring at the cutting and sealing station S_c and after both of these operations have been completed, the turret **87** is indexed once more to position the lead mandrel carrying the finished ring to the discharge station S_d. At this station the mandrel retracts into the turret and the finished ring is ejected from the face of the turret by means of an air jet **120**. The finished rings may be suitably accumulated in a hopper or the like.

The system further includes a timing and actuating mechanism **130**, in the present instance illustrated schematically as being connected to various elements of the system to effect operation thereof in the manner described above.

This timing and actuating mechanism may be comprised of a number of conventional elements and mechanism arranged and coordinated, for example, to effect intermittent feed of the strip material by the rollers **80** and **82** during indexing of the turret, coordinated and intertimed actuation of the cutter **96**, pusher **100** and welding mechanism **102** in the workhead **85**, movement of the mandrel **89** and sleeves **118** relative to the turret **87** and actuation of the rolling mechanism **110**, and air jet discharge **120** at precisely coordinated intervals.

While a particular embodiment of the present invention has been illustrated and described herein, it is not intended to limit the invention and changes and modifications may be made therein within the scope of the following claims.

I claim:

1. A tamper-proof ring for securing a closure over the open end of a container having a radial projection which lies closely adjacent the lower terminal edge of the closure when the closure is fully seated on the container in the closed position, said ring comprising a generally cylindrical sidewall, a radially inwardly projecting circumferentially extending upper flange engaging over a bead on the closure and a radially inwardly projecting circumferentially extending lower flange seating under the projection on the container and means defining at least one score line formed in the ring defining an area of reduced thickness extending across the entire width of the ring between the edge of the upper and lower flanges whereby upon movement of the closure in a direction to remove it from the container, the ring fractures along said score line.

2. A tamper-proof ring as claimed in claim **1** including a plurality of axially extending circumferentially spaced score lines.

3. A tamper-proof ring as claimed in claim **1** wherein the ring is made of a piece of strip material which is secured at its overlapping ends.

4. A tamper-proof ring as claimed in claim **3** wherein the ring is provided with an outer layer of a bonding material whereby the ends of the ring may be secured in overlapping relation by application of heat and/or pressure.

5. In combination, a container having an opening therein with a radial projection spaced downwardly from the opening, a closure adapted to be detachably secured over the open end of the container, the closure having a skirt with a radially outwardly projecting bead adjacent its lower terminal edge closely adjacent the radial projection on the container when the closure is applied tehreto and a ring for tamperproofing the container-closure assembly comprising a generally cylindrical sidewall having an upper circumferentially extending radially inwardly projecting flange engaging over and snugly embracing the bead of the cap and a lower radially inwardly circumferentially extending flange engaging under the radial projection on the container and at least one score line formed in the ring defining an area of reduced thickness extending across the entire width of the ring between the edge of the upper and lower flanges adapted to fracture upon movement of the closure in a direction to remove it from the container and thereby providing a truly tamper-proof assembly.

6. The combination as claimed in claim 5 wherein the container has a helical screw thread adjacent the opening and the closure has complementary screw threads so that the closure may be removed from the container by turning thereof.

7. The combination as claimed in claim 5 wherein the ring is made of a strip material and is provided with an outer layer of a bonding material whereby the ends of the ring may be secured in overlapping relation by application of heat and/or pressure.

8. In combination, a container having an opening therein with a radial projection spaced downwardly from the opening, a closure adapted to be detachably secured over the open end of the container, the closure having a skirt with a radially outwardly projecting bead adjacent its lower terminal edge closely adjacent the radial projection on the container when the closure is applied thereto and a ring for tamperproofing the container-closure assembly comprising a generally cylindrical sidewall having an upper circumferentially extending radially inwardly projecting flange engaging over and snugly embracing the bead of the cap and a lower radially inwardly circumferentially extending flange engaging under the radial projection on the container and a plurality of circumferentially spaced score lines in the ring, each of said score lines extending across the entire width of the ring between the edge of the upper and lower flanges, one of said score lines fracturing during movement of the closure in a direction to remove it from the container and the others providing hinge means for removing the ring.

9. The combination as claimed in claim 8, wherein the score lines are axial.

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U.S. Cl. X.R.

215—95; 292—256.61