

CREATING THE NEXT GENERATION OF FLEXIBLE RECLOSABLE PACKAGES

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Abstract

Reclosure features have been available on flexible packaging for decades. The reclosure has to a great extent become a standard feature versus an option. End user expectations for a positive package experience have led to the creation of reclosures and technology that can address the unmet needs that remain a concern of the consumer. New developments in reclosable technology are presented that extend the capabilities of the reclosure to further engage the end user.

Introduction

Zipper type reclosures have been available for many years, finding their way from the child's zippered pencil case to consumer food storage bags and then on to flexible food packaging. It has been literally decades since the first examples of reclosable cheese and hot dog packages made their appearance on the grocery store shelves. Since their introduction into form fill seal (FFS) packaging, zippers have been placed into many styles of flexible package, across multiple machine formats. Today, one can find reclosures on almost anywhere one looks in a grocery store, whether it is on shredded cheese, pre-packaged sliced deli meats, pet food or even salty snacks.

Along with the proliferation of the variety of food types and package styles containing a reclosure, the zipper has morphed into multiple styles, some of which are relatively utilitarian in design, while others are more specialized and adapted to specific package types or situations. Today, one can find reclosures ranging from a simple press to close "webless" zipper, an example of which can be found on tortilla packages, all the way to a slider zipper for heavy duty usage, an example of which can be found on a 10kg dog food bag. In between the extremes are the ubiquitous "press to close" style (PTC) zippers, that will typically consist of integral profiles and carrier webs (flanges), supplied as a discreet profile extrusion. Figure 1 highlights this range of zipper styles but is by no means an exhaustive representation of the possibilities.

Now that the years have passed since the introduction of zippers and they are well entrenched in flexible packaging and in the hearts and minds of the consumer, the question becomes one of "What have you done for me

lately?" With the general acceptance of the zipper, comes the higher expectation for something new and different. In the past, the package designer/developer would come up with an idea, develop it, and release it to the public, with the expectation that "if we build it they will come." As we have all become painfully aware during the recent economic slowdown, "they" will not necessarily come anymore just because the designer thinks he has a good idea. The new thinking is to engage the customer first, to determine their pain points, and then to act upon those unmet needs. This "Outside-In" thinking is in stark contrast to the old "Inside-Out" methods (i.e., build it and they will come). So, where do we start with this new development strategy? A survey of current trends in flexible packaging was used to determine what the next generation of zippered packages may look like.

Trend Analysis

Romanik[1] recently published an article identifying eleven trends that he felt were relevant and developing influences on flexible packaging. The list:

1. More easy-open, easy-reclose options
2. Clear high-barrier films
3. Penetration into entirely new categories
4. Viscous liquids in flexible pouches
5. Slow conversion of cereal from bag-in-box
6. More layers in coextrusion
7. Shaped flexible packaging
8. More retortable pouches
9. Pouches containing a wider range of liquid, viscous, powdered, granulated and particulate products
10. Sustainability in packaging
11. Waste-to-Energy

Interesting to note here that the number one item listed is More easy-open, easy-reclose options on flexible packaging. A further study performed by Zip-Pak[2] on key trends in global packaging seems to corroborate Romanik's number one finding - the world has changing demographics and an aging population. One of the conclusions of the study was that "packaging must accommodate an aging consumer base with more easier-to-open packaging formats." It would seem to be a simple extension of this thought to conclude that this same packaging must also be easier to reclose. Anthony[3] confirms this notion in his discussion of the importance of easy-to-open packaging.

There are yet other trends that have been gaining ground -

- The rise of the store brand as a rival to the national brand - the store brands are using packaging enhancements as a way to compete head to head with the CPGs for the consumers' dollar
- Globalization - innovations can originate from anywhere in the world, and turn up on the other side of the planet in the blink of an eye
- Consumers' desire for bolder, richer experiences by achieving a more intense experience to any or all of the senses[4]

Based on the studies cited above, it appears that the consumer still would like additional reassurance that their package will open and reclose simply and efficiently. Add to that the desire to engage more of the senses in this process, and we have the criteria to begin designing the next generation reclosure. We will approach this as a three step process, looking first individually and then collectively at ease of opening; ease of reclosing; and engagement of the end user in a multisensory fashion.

Redesigning Easy-to-Open

The first step in our new package will be to address ease of opening concern. While there are several methods for providing ease of opening, some designs are preferred over others. While simple perforations will allow the user to tear the top off of a flexible package without needing scissors to cut it open, the perforated package is not air tight and will not properly protect many products that require a hermetically sealed package until being opened by the consumer. So, perforations are out. Laser scoring of the package film can be an option, as well the new generation of film structures available that exhibit straight line tear features. Use of these features in a flexible package can become problematic, depending upon how the package will be produced. If the package is produced in a vertical form fill seal arrangement, that would require the easy tear feature to be placed in the cross direction of the film. This is not a good arrangement for straight line tear film, nor is it optimal for laser scored film. While a laser score can be placed in the cross direction, the process must be monitored carefully to assure that excessive web tension does not cause premature tearing of the score.

Peelable seals are another tool that the package designer has at their disposal to achieve ease of opening. Everyone is familiar with the salty snack bag that can be gripped and pulled open at the top with relative ease. This method of opening may not work as well on a heavier gauge film structure, plus the addition of a zipper just below the bag top will also make this method of opening

more difficult. Without some more positive way of gripping the package film above a closed zipper, this method of opening becomes extremely difficult.

A final option would be to consider utilizing the zipper closure itself as the means for achieving ease of opening. Indeed, after the film at the top of a package is either opened or removed above the zipper, the zipper in effect becomes the "fourth side" of the package. So, one would ask, why cannot the zipper function in this fashion for the initial opening of the package as well? One way in which the zipper can achieve this is shown in Figure 2. Here the zipper has incorporated into its construction a peelable seal above the zipper profiles. This seal can be pre-activated on the zipper prior to it being placed into the package to ensure a uniform hermetic seal. The peel strength of this seal can be adjusted in order to balance the force needed to open the seal with the need for that seal to remain unopened until such time as the end user wishes to open it.

Any of the design options listed above can produce the easy open feature so desired by the Consumer; however, for maximum flexibility an easy open peelable seal pre-applied to the zipper flanges is the most versatile of the choices. This type of construction has been demonstrated to effectively function as the fourth side of the package, maintaining hermeticity from point of manufacture through initial opening. Force required to pull this seal open can be tailored to the package designer's requirements, assuring a pleasant experience for the end user.

Ease of Reclosure

Beyond the question of how to open it, one of the more frustrating aspects of reclosable packaging occurs when the consumer is done taking product out of the package, goes to reclose the pack, and then finds that they have failed in their attempt to reclose the zipper. There are multiple reasons that this can happen, but at the end of the day the failure of the zipper to reclose will be due to the zipper profiles not re-aligning as the consumer presses the zipper together to reseal the pack. This can be especially frustrating in packages with wider mouth openings, where the flexibility of the package film seemingly is working against the consumer who is trying to re-align the zipper and get it to close correctly. The trend has been further accelerated by recent advances that have allowed for thinner gauge film constructions, which become even more flexible.

One answer to the alignment issue is the use of a double profile zipper, such as is shown in Figure 3. The addition of the second profile effectively stiffens the zipper

and the film substrate that it is attached to. This allows the user to more easily re-align the two profiles when closing the package, plus it has an added sensory benefit - as the consumer slides their finger across the package to finish reclosing the zipper, they can *feel* their finger resting in the space between the two profiles, so they know that they are closing the package correctly.

The advent of the double profile closure has gone a long way toward resolving the ease of closure issue; however, as good a solution as it is, it can still be misaligned - it is not foolproof. Christoff[5] had proposed a solution to this problem that recently has been adopted by several producers or reclose solutions. The self-aligning or multi-align reclosure can be looked at as an evolution of the hook-and-loop style of closure. This has become a closure style that has been variously described as "hook to hook", "self mating micro-hooks", or a "resealable matrix". Typical examples of this closure are shown in Figure 4. In any case, this closure option provides the package designer with a solution that is as close to foolproof as one can get, for it will reclose even if it is not totally re-aligned, plus it takes relatively little effort to close this feature. These solutions presented will allow the package designer to create an improved easy-to-open and easy-to-close package, but there are further enhancements possible that allow the package designer and the package to engage more of the Consumers' senses with unique features.

Engaging the Senses

The zippered package has become a standard part of the packaging landscape, and we as end users have become almost oblivious to the reclose feature(except if it fails!). The development of double profile and multi-align closures now provides the package designer the unique opportunity to engage several of the consumers senses simultaneously, with what can be described here as **Interactive Packaging**. We had seen earlier that the double profile zipper can give the user a subtle tactile cue that the zipper is aligned and closing correctly, by the way the finger fits against the package. With the new generation of closures, it is possible to improve upon that experience with a much more positive use of tactile and audible cues.

Addition of audible and tactile features can be accomplished in several ways, two of which are shown in Figure 5. In a post extrusion step, the closure profiles can be reshaped, either via a mechanical deformation step or by the simple removal of material. This post forming does not and should not impede the ability of the zipper to function

as a closure. Rather, these deformations increase the tactile feedback to the user, as well as provide an distinctly audible "clicking" sound. As one would expect, the degree of closure deformation will have an impact upon the resultant tactile and audible response that the end user will experience. These features have been successfully added to both double profile and multi-align closures, giving the designer yet another opportunity to engage their customers.

Conclusions

While the zipper closure has been available to the package designer for decades, there are still opportunities to improve upon that feature. A survey of consumer and packaging trends reveals that ease of open/reclose remain a consumer priority, while a more engaging experience is desired. Closure developments will now allow the package designer to consider the zipper as the legitimate fourth side of the package, providing ease of initial package opening along with a simple and secure reclose experience. The addition of audible and tactile features gives the designer the ability to provide a truly Interactive Package experience - the consumer can see the package is open or closed, and they can hear and feel the package opening and closing, giving them the peace of mind that their package is functioning correctly.

References

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3. Sterling Anthony, "*The Importance of Easy-to-Open Packaging*", Packaging World (July 2013)
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5. Paul B. Christoff, US Patent 4,617,683

Key Words

Flexible Packaging; Zipper; Reclosures

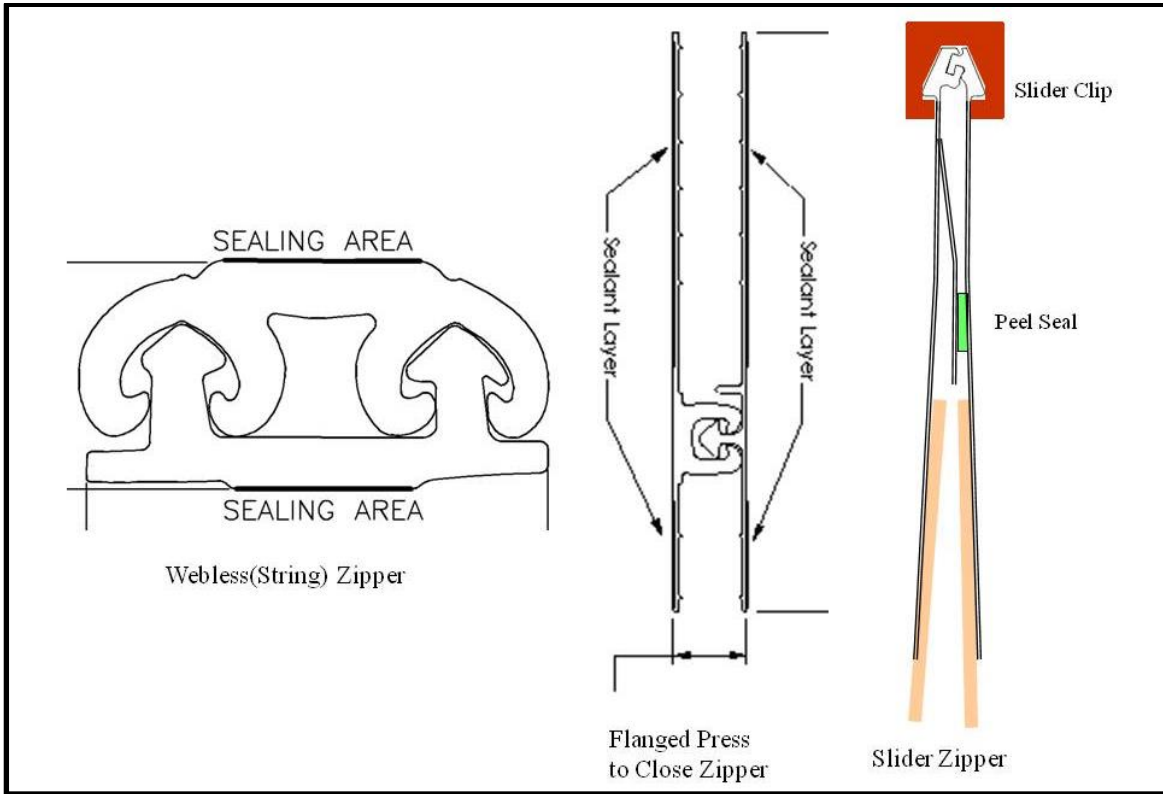


Figure 1: Representative styles of zipper reclosures

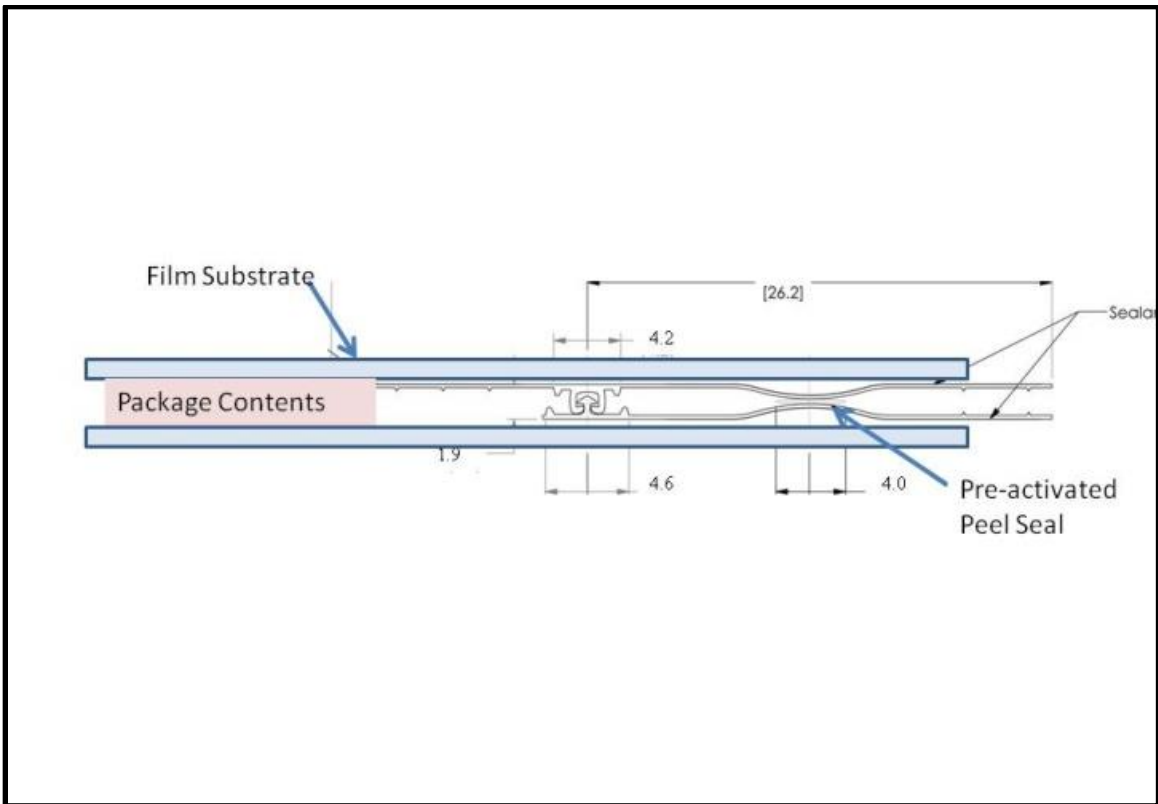


Figure 2: Example of an Easy-to-Open package, utilizing a peelable seal integral to the zipper

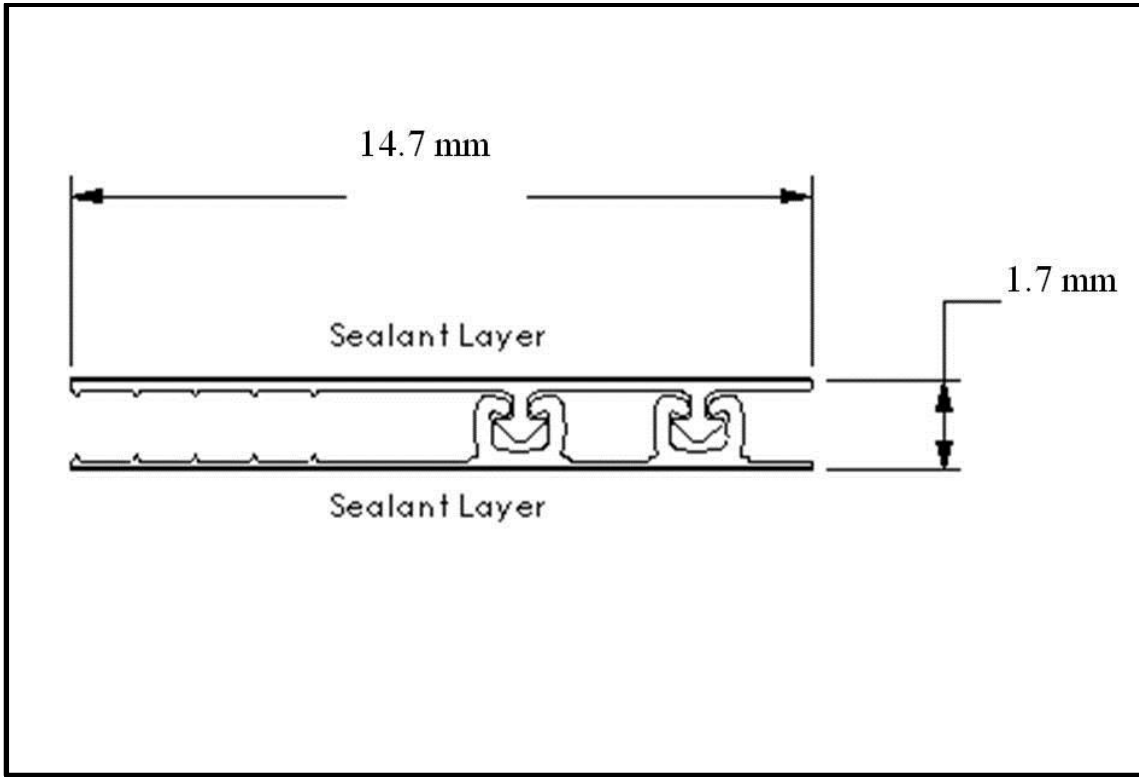


Figure 3: Example of a double profile zipper

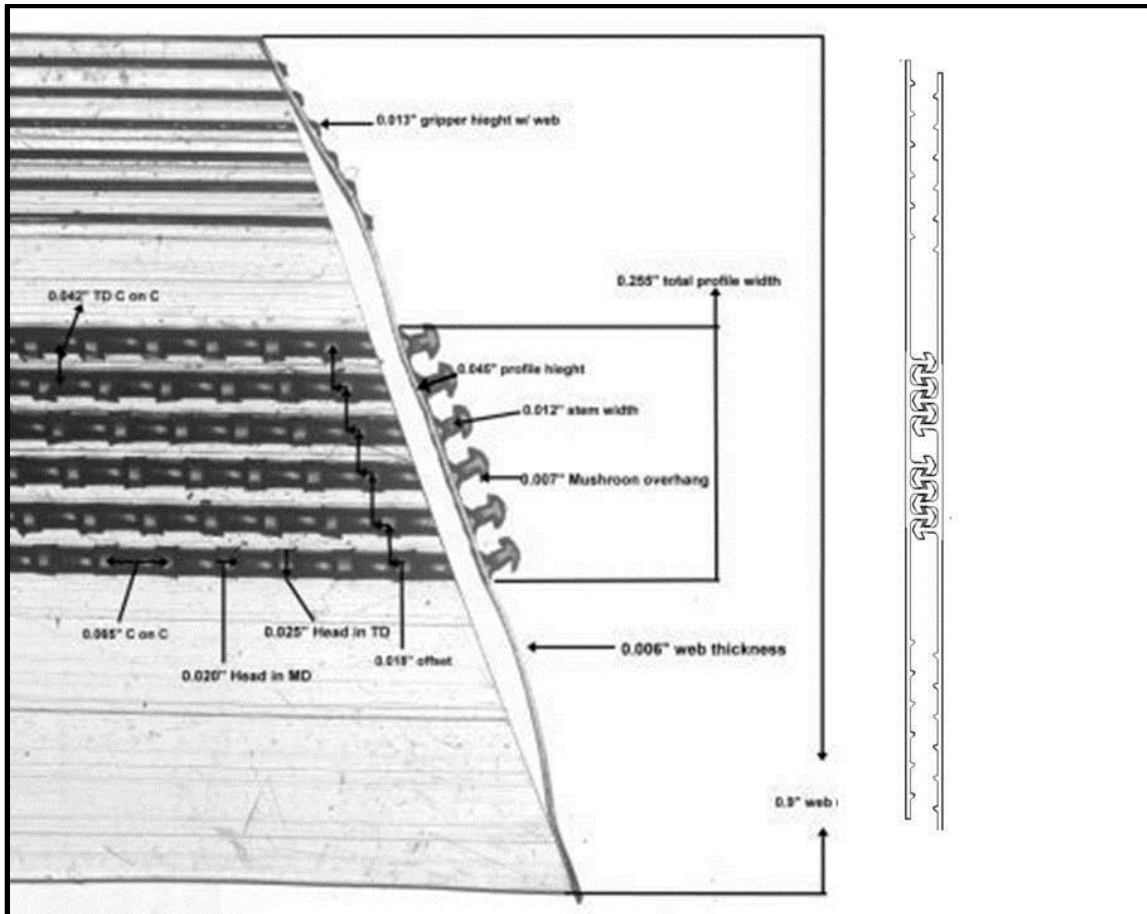
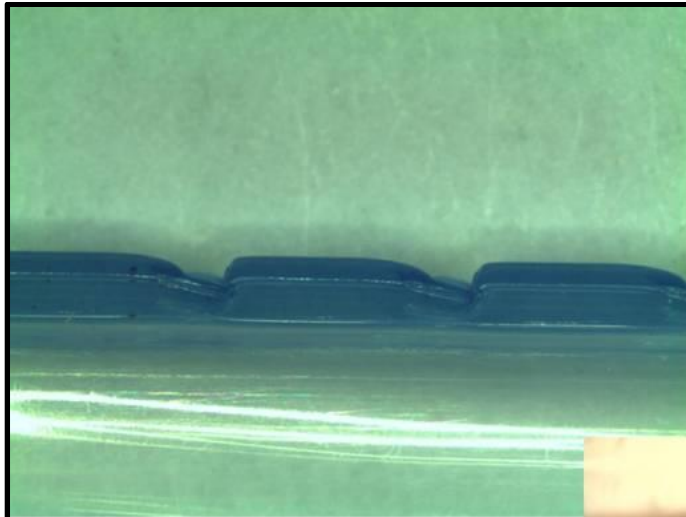


Figure 4: Multi-align styles of reclosure



Sensory feature produced by zipper profile deformation

Sensory feature produced by zipper material removal

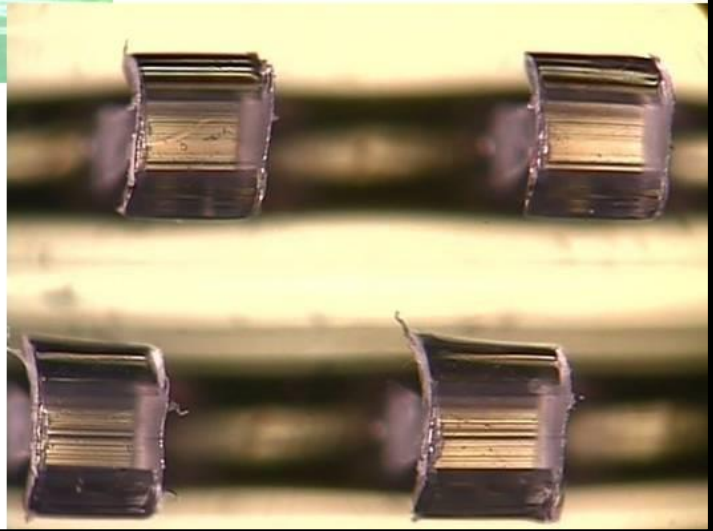


Figure 5: Enlarged view of audible/tactile features added to a reclosure