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PRESSURE SEALING ZIPPER

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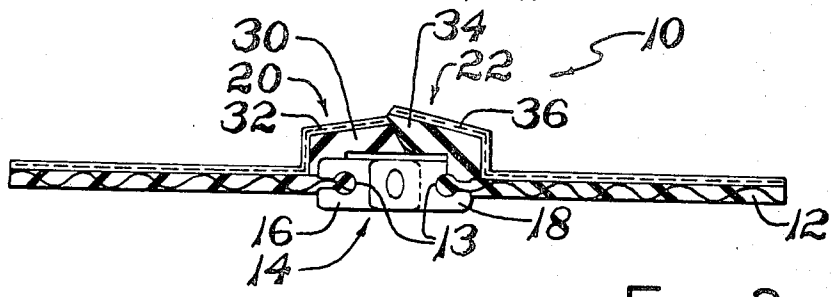
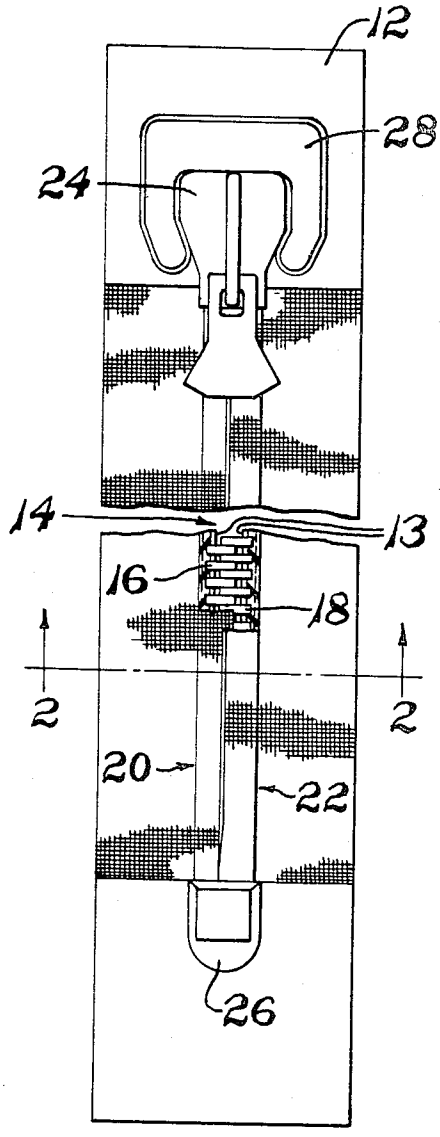


FIG. 2



10

FIG. 1

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PRESSURE SEALING ZIPPER

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ABSTRACT OF THE DISCLOSURE

This disclosure relates to an improved pressure sealing zipper which incorporates the use of fabric covered sealing lips to reduce slider resistance and air leakage caused by slider wear.

One of the most difficult problems encountered in the use of pressure sealing zippers is the eventual air leakage that develops along the lengths of the zipper sealing members as a result of a deterioration of these sealing members caused by the zipper slider rubbing against the sealing members during the opening and closing of the zipper.

Closely related to the leakage problem is the physical difficulty of overcoming the frictional forces that resist the movement of the slider over the sealing members. Still another problem in pressure sealing zippers is the necessity for the zippers to overcome the lateral forces of the opposing unjoined materials which act along the lengthwise edges of the zippers resisting the closing of the zipper.

In the search for improvements in pressure sealing zippers to eliminate the foregoing problems, some improvement in slider friction resistance was obtained by the use of highly abrasive resistant sealing lips. However, this improvement in slider friction was overweighed by the fact that sealing lips made of these more abrasive resistant materials were generally found to have inferior air sealing capabilities, and therefore the mere substitution of more abrasive materials in the sealing lips did not improve the overall product.

Other attempts to improve zipper performance included the case hardening of the sealing surfaces, but this resulted in a deterioration in the sealing ability of these surfaces. The addition of a fluorocarbon coating to both the slider surface and the sealing lip surfaces showed considerable improvement in reducing slider friction but the fluorocarbon coating on the sealing lips was not satisfactory due to the fact that the sealing lips failed to reseal properly since the fluorocarbon coating reduced the resiliency and memory characteristics of the sealing lips. The addition of internal lubricants to the compounds used for making the sealing lips were found to rub out quickly and have little lasting effect on the zipper performance.

Further attempts to provide an improved pressure sealing zipper included the use of new zipper scoop links and zipper slider designs wtih little noticeable improvement in reducing either slider friction or air leakage. Similarly, the techniques of molding were examined to see if closer tolerances in the manufacture of sealing lips would provide any improvement, but it was found that the limited improvement in zipper performance resulting from tighter manufacturing techniques did not justify the increased cost of manufacturing.

The greatest improvement in reducing slider friction up to the present invention was obtained by molding the slider engaging surfaces of the sealing lips in stippled molds; however, this change did not effect any appreciable improvement in zipper durability.

The invention resulting after the foregoing attempts did substantially improve slider friction resistance and air leakage. Moreover, this invention unexpectedly provided a zipper construction which reduced the amount of force necessary to overcome the normal lateral forces that resist

zipper closing. This unexpected result is especially advantageous in the use of pressure sealing zippers that closely follow a contoured surface, as for example in the use of zippers on body contoured space suits where these lateral forces are very irregular and unbalanced.

According to this invention the foregoing improvements are obtained by bonding an external fabric reinforcing liner to the slider engaging surface of each of the mating pressure sealing members.

The invention will be further described with reference to the accompanying drawings which illustrate a pressure sealing zipper unit made according to and incorporating the preferred embodiments of this invention.

In the drawings:

FIG. 1 is a plan view of a zipper unit in its closed condition.

FIG. 2 is a cross sectional view of FIG. 1 at line 2—2.

The zipper unit **10** shown in FIG. 1 includes a generally rectangular web **12** with a longitudinal slot **13**, and a coupling link chain member **14** which is fastened at its opposite uncoupled edges in the slotted portion **13** of web strip **12**. This coupling chain **14** consists of a left link **16** and a right link **18** which are shown in their fully coupled position in the slot **13** of web **12**.

The zipper unit **10** further includes a left zipper sealing member **20** and a mating right zipper sealing member **22** which will hereinafter be more fully described.

A slider **24** is slidably interlocked with the coupling chain **14** and the sealing portions of sealing members **20** and **22** to effect the coupling of chain links **16** and **18** and the sealing of mating sealing members **20** and **22** in a manner well known to the art. One end of chain **14** and the ends of sealing members **20** and **22** are sealed by a stop **26** and the opposite ends of these elements are sealed by a U-shaped guide flange **28** which is shaped to receive the slider **24** whenever the zipper is fully closed, as shown in FIG. 1.

The web strip **12** is fabricated of preferably a square-woven fabric and the uncoupled edges of chain **14** are fastened to the slot **13** in web **12** by conventional methods of zipper manufacture. Similarly, the zipper stop **26**, the slider **24** and the guide flange **28** are standard zipper elements that may be assembled by conventional manufacturing techniques, which are also well known to the art.

Referring to FIG. 2, the left sealing member **20** includes an elastic, preferably rubber, sealing lip **30** which is molded along the left edge of slot **13** as shown in FIG. 2. The sealing member **20** further includes a fabric reinforcing liner **32** which is bonded to adhere to the zipper unit **10** over the slider engaging face of sealing lip **30** and preferably over the full left width of web **12**.

Similarly, in the right half of zipper unit **10**, as viewed in FIG. 2, the sealing member **22** includes a sealing lip **34** which is adapted for mating with sealing lip **30** in an interference fit to positively seal the slot **13** of web **12**. This sealing lip **34** is also covered by a fabric reinforcing liner **36** which overlies the slider-engaging face of sealing member **34** and extends over the right width of web **12**. The fabric reinforced liners **34** and **36** are preferably made of a square-woven fabric material having one side (i.e. the non-slider engaging side) coated with a suitable elastomeric material to aid the bonding of the liner to their respective sealing lips. However, it has been found that bare fabric, having a suitable adhesive dipping can also be adhered to the sealing lips to provide similar results.

The operation of sealing unit **10** is identical to that of a conventional pressure sealing zipper but the reinforcing liners **32** and **36** provide slider-engaging surfaces that have low coefficients of friction, thereby reducing the frictional forces that resist the sliding movement of slider **24** over the sealing members **20** and **22**. Moreover, these rein-

forcing liners **32** and **36** furnish a wear-resistant covering over the sealing lips **30** and **34** to assure that these sealing lips maintain their sealing capabilities over a substantial number of opening and closing cycles.

I claim:

1. In a sealing closure for uniting in sealing relationship margins of a flexible material wherein the said closure comprises an opposed series of spaced apart interlocking fastener elements attached to said margins, a pair of flexible sealing lips of elastomeric material attached to said margins and adapted to extend in overlapping engagement with each other over one face of the said elements when the latter are engaged, and a slider comprising a pair of plate-like portions in contact, respectively, with said fastener elements and said lips, the improvement

which comprises a fabric liner bonded on the slider contact surface of each of the sealing lips.

2. A sealing closure for uniting in sealing relationship margins of a flexible material according to claim **1** wherein each of said fabric liners comprises a square woven fabric having an elastomeric coating on at least one side of said fabric liner to facilitate the bonding of said fabric liner to each of the sealing lips.

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BERNARD A. GELAK, *Primary Examiner.*