

Sept. 9, 1969

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3,466,077

ALL-PLASTIC SEAL

Filed May 1, 1968

2 Sheets-Sheet 1

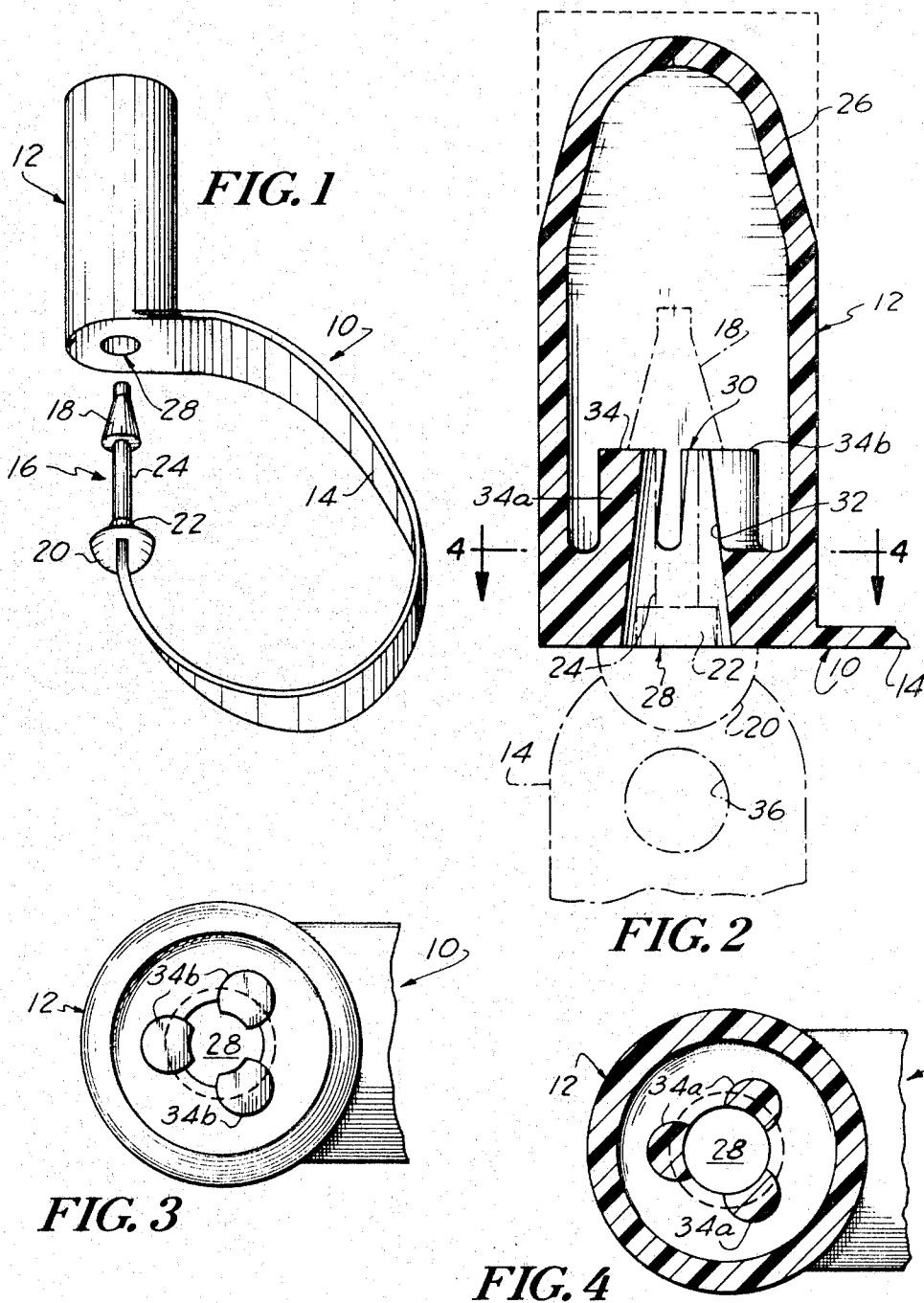


FIG. 2

FIG. 3

FIG. 4

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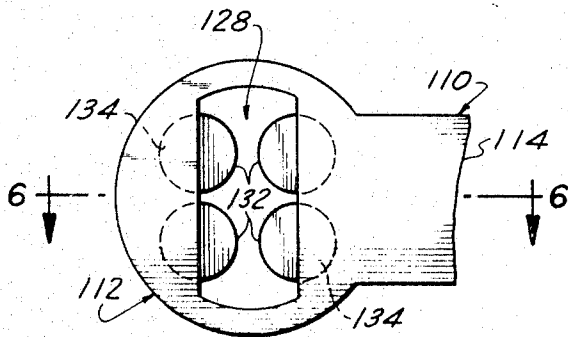


FIG. 5

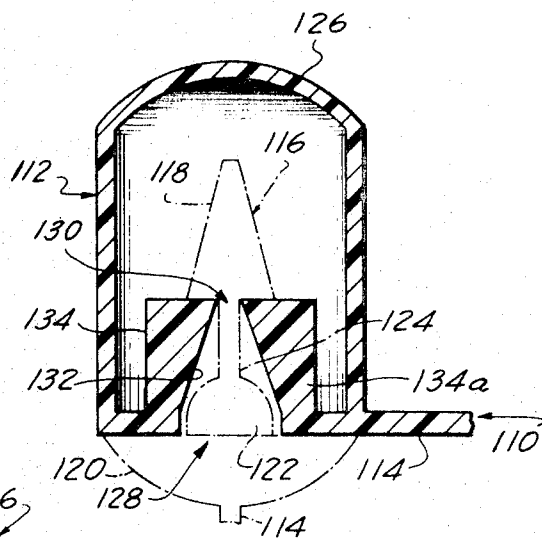


FIG. 6

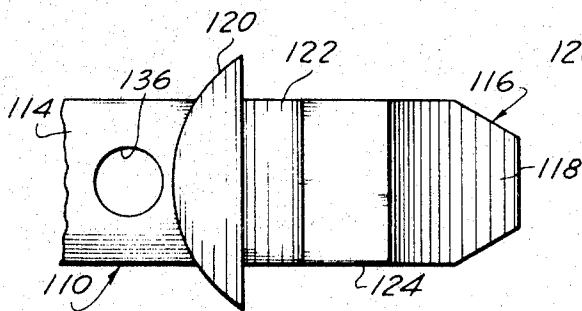


FIG. 7

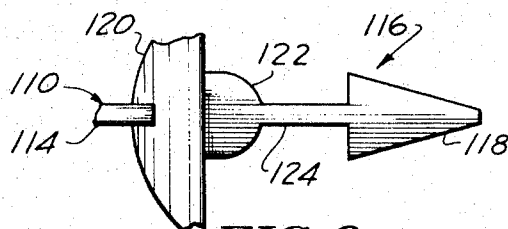


FIG. 8

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1

3,466,077

ALL-PLASTIC SEAL

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Filed May 1, 1968, Ser. No. 725,628

Int. Cl. B65d 55/06, 63/00

U.S. Cl. 292—322

8 Claims

ABSTRACT OF THE DISCLOSURE

A one-piece seal formed entirely of moldable, resilient plastic material includes a group of resilient fingers enclosed within a generally cylindrical housing, and a shackle fixed, at one end thereof, to said housing and its other end being insertable to a limited extent into an opening in one end of the housing to lockably engage said fingers. To deny tampering access to said fingers within which a shackle end is locked, the other end of the housing is completely closed and the shackle includes a space-filling portion to close said opening.

Background of this invention

Prior shackle seals have provided locking fingers at one end of the shackle to lockably engage the other end of the shackle. The interlocked parts, however, have, objectionably, been entirely accessible, making it possible for an interloper to open the seal and reuse it.

The present invention, by providing a completely closed housing, as indicated in the foregoing abstract, overcomes the just stated objection.

The drawing

In the drawing:

FIG. 1 is a perspective view of a preferred form of seal according to this invention, as immediately prior to a last step in the manufacture thereof. Although the seal may be made in various sizes, this figure shows the seal approximately twice the actual size of one form of practical, usable seal.

FIG. 2 is a greatly enlarged, central, axial, sectional view of the housing of said seal and parts therein, shown in full lines as after completion of said last step; one end portion of the housing being shown in broken lines as before said last step, and end, interlocked portions of a related shackle being also shown in broken lines.

FIG. 3 is a similarly enlarged, end elevational view of the unfinished seal of FIG. 1, as viewed from the top of that figure.

FIG. 4 is a cross-sectional view, substantially on the line 4—4 of FIG. 2; the parts of the shackle being omitted.

FIG. 5 is an end elevational view of the open end of an otherwise closed housing of a modified form of seal according to this invention.

FIG. 6 is a central, axial sectional view of the housing of FIG. 5, substantially on the line 6—6 of FIG. 5; end, interlocked portions of a related shackle being shown in broken lines.

FIG. 7 is a fragmentary, broadside view of the free or lockable end of a band-like shackle of the modified seal.

2

FIG. 8 is an edgewise view of the same parts illustrated in FIG. 7.

Description of the illustrated seals

The seals are molded, in one piece, of suitable plastic material such as, for example, polyethylene, which is relatively rigid in thick sections and flexible in thin sections. The plastic material selected should have such hardness and flexibility characteristics as would enable the molded seal to function as hereinafter described.

The seal illustrated as a first embodiment (FIGS. 1—4) comprises two essential principal parts, a flexible shackle 10 and a shackle capturing housing 12 to which one end of the shackle is integrally connected.

The shackle 10 is a flat band 14 which is thin enough to give it substantial flexibility. Its free end is formed as a locking portion 16 which includes an annular arrowhead member 18 at the extremity of the band 14, an annular stop member 20, spaced from the arrowhead member, and an annular space-filling portion 22 at the side of the stop member which faces the arrowhead member. The portion 22, also, is suitably spaced from the arrowhead member, and an intervening portion 24 connects the arrowhead member 18 to the space-filling portion 22.

The housing 12 is generally cylindrical and substantially hollow. In its form as completely manufactured and supplied to a user, one of its ends is closed as at 26. The other end of the housing has a coaxial opening 28 leading into a tapered coaxial passage 30, the inner end of which is defined by inner, tapering surfaces 32 of plural, circularly arranged resilient fingers 34.

The illustrated first embodiment is provided with a group of three similar, axially extending fingers 34, which are spaced sufficiently from adjacent wall portions of the housing to enable them to flex as hereinafter described. These fingers are generally cylindrical in shape; departing from such shape only in the tapering surfaces 32 thereof. The tapering of these surfaces is such that roots 34a of the fingers are thinner than the extremities 34b of said fingers. The roots are thin enough to facilitate flexing of the fingers thereat, while their extremities are thick enough and rigid enough to enable the fingers to perform a locking function hereinafter described.

The closing of end 26 of the housing 12 is the mentioned last step in manufacturing the seal. This step involves use of a suitable die, under suitable heat and pressure, to draw in the wall of said end 26 from its broken line to its full line condition shown in FIG. 2. It will be observed that after completion of manufacture, the extremities 34b of the fingers 34 are substantially spaced from the drawn-in end wall.

The seal is preferably formed with an opening 36 in the band portion of the shackle 10, adjacent to the stop member 20. Said opening provides an area of relative weakness to induce breakage of the shackle in the presence of undue manipulation which probably would occur in an attempt of an interloper to open the seal without rendering it non-reusable.

The seal is particularly useful for sealing hasps on railway car doors, doors of other vehicles, covers of boxes or other containers, etc. In use, the locking portion 16, at the free end of the shackle, is pushed edgewise into the housing's opening 28. Because of the tapers of the

arrowhead member 18 and of the finger surfaces 32, the member 18 wedges the fingers 34 radially outwardly, sliding easily into the housing until the back end of said member clears the extremities 34b of the fingers 34, whereupon the latter resiliently contract to cause flat, end surfaces of said fingers to seat upon a flat, annular rear surface of the arrowhead member 18. With the fingers and the arrowhead member thus interengaged, the shackle 10 is securely held against withdrawal from the housing 12.

After the fingers 34 and the arrowhead member 18 become thus interlocked, the stop member 20 is in intimate association with the adjacent end of the housing 12, thereby preventing material endwise movement of the shackle's locking portion 16 within the housing.

Upon movement of locking portion 16 to its locking position relatively to the fingers 34, the space-filling portion 22 of the shackle enters and substantially fills the housing's opening 28, thereby preventing lateral looseness of the shackle. As the opening 28 must be large enough to enable the arrowhead member 18 to pass therethrough, and the intervening portion 24 of the shackle's locking portion 16 must be thin enough to permit the fingers and the arrowhead portion to interlock as described, it will be understood that, without the space-filling portion 22, the shackle would possess objectionable lateral looseness in the housing.

The modified form of seal illustrated in FIGS. 5-8 differs from the seal of FIGS. 1-4 chiefly in that locking portion 116 of shackle 110 is angular rather than circular in cross section, and interlockingly engages a rectangularly arranged, rather than a circularly arranged, group of fingers 134.

The locking portion 116 includes a relatively flat, wedge shaped, arrowhead member 118 at the extremity of a band 114 of the shackle, a transversely oblong stop member 120, spaced from the arrowhead member, and a transversely oblong space-filling portion 122 at the side of the stop member which faces the arrowhead member. The portion 122, also, is suitably spaced from the arrowhead member, and an intervening portion 124 connects the arrowhead member 118 to the space-filling portion 122. The said intervening portion is in the nature of a continuation of the band 114.

A substantially hollow housing 112 of the modified form of seal has a transversely oblong opening 128 at one end, and the housing's other end 126 is closed. The opening 128 leads into a tapered passage 130, defined by inner, substantially flat and parallel tapering surfaces 132 of the rectangularly arranged fingers 134. These fingers, except for their tapering surfaces 132, are each substantially cylindrical in shape. Because of the taper of the surfaces 132, the fingers' roots 134a are thin enough to facilitate flexing of the fingers at their roots, while their extremities are thick enough and rigid enough to enable the fingers to perform a locking function hereinafter described.

The modified form of seal is utilized in the same manner as the seal of FIGS. 1-4. Thus, pushing of the arrowhead member 118 into opening 128 and through tapered passage 130 (FIG. 6) wedges the fingers 134 outwardly until stop member 120 enters into abutment with the housing 112. At that point, said fingers resiliently contract to their normal or unstressed condition to cause flat, end surfaces of the fingers to seat, in locking engagement, upon a flat rear surface of the arrowhead member. When the parts are thus interlocked, the space filling portion 122 substantially fills the opening 128 and prevents any material lateral shifting of the shackle's locking portion 116 in the housing 112.

Interlopers, attempting to open any seal, without rendering it non-reusable, often attempt to release interlocking parts by using a suitable, usually very thin, in-

strument to effect such release. This invention defeats such attempts by reason of the facts that the housing 12 or 112 completely enclosed the locking fingers 30 or 130, and the stop member 20 or 120 and the space-filling portion 22 or 122 completely block off and fill the opening 28 or 128 to prevent the introduction of any instrument into the housing for the purpose of releasing locking fingers 34 or 134 from their locking engagement with arrowhead member 18 or 118.

The described concepts may be utilized in other ways than shown herein, without departing from the invention.

I claim:

1. A one-piece seal constituted entirely of moldable, plastic material which is resilient in relatively thin sections and relatively rigid in thicker sections, said seal comprising a hollow, cylindrical, housing having an opening, at one end thereof, leading into the housing's interior, an elongate shackle integral, at one of its ends, with said housing and having a locking portion at its other end adapted to enter said opening for interlocking association with said housing, locking means, within said housing adapted to coact with said locking portion to hold the latter against withdrawal from said housing, and a stop member, on said shackle, adapted to abut housing portions, defining said opening, to limit the extent of movement of said locking portion into the housing; said locking portion having a wedge shaped extremity portion, terminating at its rearward end in a transversely extending surface, and said locking means comprising plural, similar, resilient fingers within said housing, having root portions, integral with said housing toward the latter's said one end and extending freely within said housing toward the latter's other end, said fingers having inner surfaces tapering toward said other end of the housing and defining an expansible, wedge shaped passage adapted to receive said wedge shaped portion there-within, and said fingers having transversely extending surfaces at their free ends; said wedge shaped portion of the shackle and said fingers being so shaped relatively to each other as to permit finger expanding movement of said locking portion into the housing and between said fingers until said transversely extending surfaces of said wedge shaped portion and of said fingers become interlocked to prevent material reverse movement of the shackle's locking portion within the housing.

2. A seal according to claim 1, said root portions being of such thinness as to enable said fingers to flex about said root portions, and said fingers having free end portions of substantially greater thickness and rigidity than said root portions.

3. A seal according to claim 1, said fingers being disposed in a circular group; and said wedge shaped portion being transversely circular.

4. A seal according to claim 1, said fingers comprising a pair thereof; the fingers of said pair having said tapering inner surfaces facing each other; and said tapering surfaces, transversely thereof, both being parallel to a plane extending therebetween; and said wedge shaped portion being transversely oblong.

5. A seal according to claim 1, said fingers including plural pairs; the fingers of each of said pairs having said tapering inner surfaces facing each other; and said tapering surfaces, transversely thereof, being parallel to a plane extending between the facing fingers of all said pairs; and said wedge shaped portion being transversely oblong.

6. A seal according to claim 1, said opening of the housing being shaped correspondingly to and at least as large as the largest cross-section of said wedge shaped extremity portion of the shackle, and the seal further including a space-filling portion of said shackle, so located on the latter and of such transverse dimension as to sub-

5

stantially fill said opening when said wedge shaped portion and said fingers are interlocked.

7. A seal according to claim 6, said fingers being disposed in a circular group, and said wedge shaped portion, said opening and said space-filling portion being transversely circular.

8. A seal according to claim 6, said fingers including a pair thereof; the fingers of said pair having said tapering inner surfaces facing each other; and, said tapering surfaces transversely thereof, being both parallel to a plane extending therebetween; said opening being oblong and said wedge shaped portion and said space-filling portion being transversely oblong.

6

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U.S. Cl. X.R.

24—16, 30.5