Feb. 9, 1971 J. H. BEIER ET AL 3,561,808

SEALING DEVICE

Filed April 22, 1968

Fig. 1

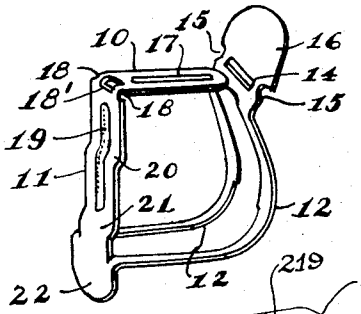
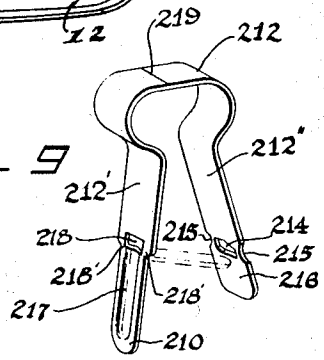


Fig. 9



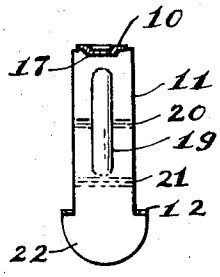


Fig. 3

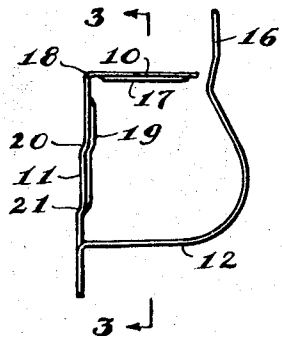
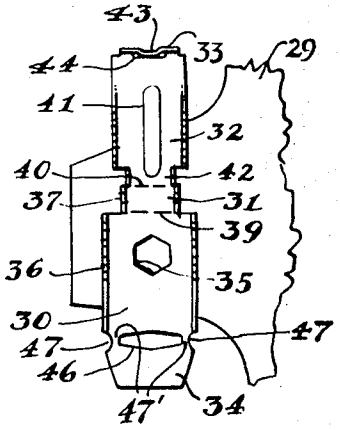


Fig. 2



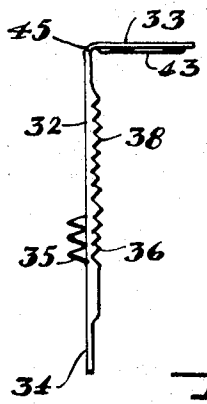


Fig. 5

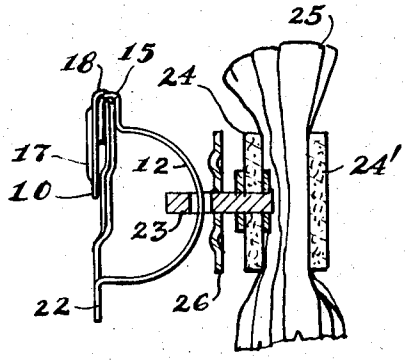


Fig. 4

Fig. 6

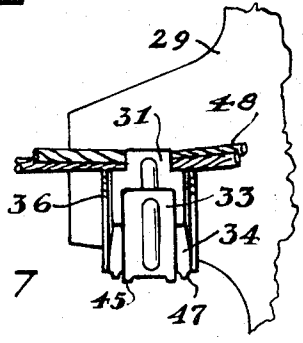


Fig. 7

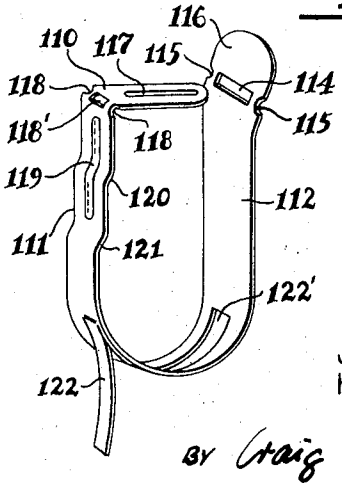


Fig. 8

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3,561,808

SEALING DEVICE

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U.S. Cl. 292—307 19 Claims

ABSTRACT OF THE DISCLOSURE

A tamper-proof seal of sheet material having a flap adapted to be inserted into an aperture of the seal and foldable in one direction of rotation for insertion into the aperture whereby the flap has to be rotated in the opposite direction approximately 270° to attach the seal, and wherein weakened zones are provided in the area connecting the flap with the seal to assure breakage of the flap in case of tampering, whereby a rotation in the one direction of about 180° is required to open the seal.

The present invention relates to sealing devices of the frangible folding type, which may be used as shackle seals, bag seals, cord seals or in other, similar applications.

Various types of sealing devices are known in the prior art. However, it has not been possible heretofore to provide a sealing device which is completely tamper-proof, yet does not require any tools for closing and/or attachment and can be made by simple mechanical operations from a single piece of sheet material.

One type of prior art sealing device utilizes scores in order to cause the seal to break within the scored area when tampered with. However, in production it is difficult to control the depth of the scores under all operating conditions. Furthermore, commercial stock sizes and tempers of sheet metal vary frequently to such an extent that the score may be either too deep or too shallow to dependably serve its purpose. As a result of such variation in the materials used with the folding seals of prior art construction, and especially also by reason of the fact that the folding flaps thereof required a relatively smaller arc of rotation for opening than necessary with the sealing devices of the present invention, it happens frequently that with too shallow a score or with a relatively heavier sheet metal material, the prior art seal can be opened and reapplied without breaking or failure, or with an excessively deep score the flap breaks off prematurely during normal handling when the seal is initially installed. In the seal according to the present invention, such failure is positively prevented by the elimination of scores, which is made possible by the increased bending or folding necessary to apply the seal and by confining in an effective and simple manner the ultimate failure of the seal to a well-defined predetermined zone.

The present invention therefore aims at avoiding the aforementioned shortcomings and drawbacks encountered with the prior art types of sealing devices, and essentially consists in that a folding flap or tongue provided at one end of a central body portion, after being bent about 90° with respect to the central body portion, is extended through an aperture provided in the connecting part between a folding tab and the loop portion, and therefore has to be bent through an arc of approximately 270° to complete the installation while the folding flap and folding tab have to be bent or unfolded again through about 180° to enable opening of the sealing device so that the sealing device fails or breaks with certainty within a predetermined area as a result of the requirement to rotate the folding flap or tongue through about 540° in the course of the folding and unfolding operations necessary for closing and opening thereof.

The predetermined zone of expected failure or breakage of the sealing device in case of tampering, according to a further feature of the present invention, is readily controllable by extremely simple means in the form of notches, apertures and the like without the need for unreliable scores used heretofore since the folding flap or tongue, intended to break off in case of tampering, has to be rotated or folded through a considerably larger angle than necessary heretofore.

Accordingly, it is an object of the present invention to provide a sealing device of the type described above which eliminates by simple means the aforementioned shortcomings and drawbacks encountered with the prior art constructions.

It is another object of the present invention to provide sealing devices of the frangible folding type which can be made from a unitary single piece of sheet metal material, do not require tools for the attachment and are as tamper-proof as possible.

A further object of the present invention resides in sealing devices of the type described above in which the security against tampering is greatly enhanced over those sealing devices presently known in the art, however, without involving complicated structures, costly and difficult manufacturing operations or expensive materials, while permitting at the same time easy manual installation and attachment without the use of tools.

Still another object of the present invention resides in a seal in which the folding flap must be rotated through relatively large angles in order to install and remove the seal, thereby assuring fatigue of the weakened zones beyond the breaking point under all circumstances.

Other objects, features, and advantages of the present invention will become more apparent from the following description taken in conjunction with the accompanying drawing, which shows, for purposes of illustration only, two embodiments of the present invention, and wherein:

FIG. 1 is a perspective view of a hasp seal incorporating the present invention;

FIG. 2 is a side view of the seal of FIG. 1;

FIG. 3 is a cross section taken along lines 3—3 of FIG. 2;

FIG. 4 is a side view of the seal when closed and secured to a staple and hasp of a bag such as a mail bag, the hasp and stable being shown in cross section and forming no part of the present invention;

FIG. 5 is a side view of a modified embodiment of a cord seal incorporating the present invention;

FIG. 6 is an end view of the seal of FIG. 5 with a paper tag attached thereto;

FIG. 7 is an end view showing the seal of FIGS. 5 and 6 in a closed position and attached to the end of a cord;

FIG. 8 is a perspective view of a still further modified embodiment of a hasp seal according to the present invention; and

FIG. 9 is a perspective view of still another embodiment of a seal in accordance with the present invention.

Referring now to the drawing wherein like reference numerals are used throughout the various views to designate like parts, and more particularly to the embodiment of FIGS. 1 to 4, the sealing device illustrated therein is made from a single, unitary piece of sheet material and comprises a central body portion **11** provided at its upper free end with a folding flap or tongue **10**. The folding flap or tongue **10** and the central body portion **11** are initially sheared out or punched out of the flat sheet material, leaving thereby the loop portion **12** which is provided at the upper end with a folding tab **16**. The

central body portion **11** and the loop portion **12** form the main body of the seal. A transverse slot or aperture **14** and laterally disposed notches **15** are provided within the area of connection of the folding tab **16** with the loop portion **12** to facilitate bending or folding of the tab **16** within this area. The folding flap **10** has a central reinforcing or stiffening rib **17** while a transverse slot or aperture **18'** as well as lateral notches are provided within the area connecting the folding flap **10** with the central body portion **11** so as to confine and concentrate the bending stresses to the narrow zones **18** of this connecting area disposed to both sides of the aperture **18'**. The central body portion **11** is also provided with a reinforcing rib **19** and, in addition thereto, is bent into the steps **20**, **21** to allow the folding flap to lie approximately in the same plane as the lower end part **22**, so that it is in effect slightly recessed. This is to reduce the likelihood of the folding flap **10** catching on a projection and thereby being accidentally opened during the normal rough handling of mail bags. The lower end part **22** of the main body portion consisting of the central body portion **11** and of the loop **12** may be of any desired length and configuration to carry indicia or identifying marks. The various parts are so shaped and dimensioned that the tongue **10** and the aperture **14** are positioned in substantial alignment so that the tongue **10** can enter readily into aperture **14** when the seal is attached to an object, in the illustrated embodiment to a staple **23** (FIG. 4). In this embodiment, the staple is secured to a leather strap **24** of the type used on mailbags. Numeral **25** indicates the bag while numeral **26** indicates a hasp secured to the free end **24'** of the leather strap. Since such straps are well known in the art and are at present widely used, a detailed description thereof is not necessary and is therefore dispensed with herein. Furthermore, the novel seal according to the present invention may be used also in other applications whenever a hasp seal is practical.

It is obvious from an inspection of the seal described in connection with FIGS. 1 through 4 that the seal can be readily manufactured by simple operations from a single sheet material and that its construction lends itself readily to mass production without costly operations to arrive at the seal, ready to use, as illustrated in FIGS. 1 and 2.

To close the shackle seal, the folding flap or tongue **10** is inserted through the complementary rectangular slots or apertures **14** until the upper part of the body portion **11** abuts against the upper part of the loop **12**. Thereupon, the flap **10** and tab **16** are jointly bent over backwards, i.e., counter-clockwise as viewed in FIGS. 1 and 2, into the position shown in FIG. 4. The tab **16** is bent approximately through 180° while the flap **10** has to be bent through approximately 270° about an axis within the zones **18**, **18**. Since the flap **10**, as shown in FIGS. 1 and 2, is originally bent 90° out of the plane of the central body portion and thereupon is bent in the opposite direction 270° when closed, the total bending necessary for closing the seal is approximately 360°. In case of attempts to tamper with the seal, the flap **10** has to be bent in the clockwise direction as viewed in FIGS. 1, 2 and 4 through about 180° thereby causing reliably failure within the zones **18**, **18**. Since the weakening of the material within the zones **18**, **18** can be readily determined and the flap **10** has to be folded initially through 360° to install the seal, the need for a further 180° folding or bending assures failure of the material within the zones **18**, **18** thereby rendering the seal as tamper-proof as possible.

In the embodiment shown in FIGS. 5 to 7, the seal consists again of a single piece of stamped, sheet metal having a back portion **30**, a cover portion **32**, connected with the back portion by the neck section **31**, and a folding flap or tongue **33** extending substantially at right angle from the cover portion **32**. By analogy, the back

portion **30**, the cover portion **32**, and the neck section **31** form the main body of the seal. An apertured folding tab **34** is provided at the free end of the back portion **30**. In this embodiment, the back portion **30** and the cover portion **32** will be referred to hereinafter as the main body portion. The body portion **30** is provided with prongs **35** pierced out of the metal for attaching a paper tag **29** or the like as shown in FIG. 6. The prongs **35** pierce the paper and are then bent over to secure the tag firmly. The back portion **30**, the neck section **31**, and the cover **32** have bent-up serrated or toothed sides **36**, **37** and **38**, respectively. These teeth or serrations serve to secure the ends of a cord or cords and should be located at and near the neck section **31** where the cords are normally placed. The neck section **31** serves to space the back portion **30** and the cover portion **32** of the main body to accommodate the cords when the seal is closed. For this purpose, the bending has to take place in two places where the metal is scored, as at **39** and **40**. However, these scores **39** and **40** have nothing to do with the tamper-proof properties of the seal, determined only by the failure of the folding flap or tongue **33**. The cover portion **32** is provided with a central stiffening rib **41** and includes a narrow section **42** connecting the neck portion **31** with the back portion **30**. The sides of the narrow section **42** of the cover portion **32** are also bent up and provided with similar teeth or serrations. This narrow section **42** is of such width as to fit inside the bent-up sides of the neck portion **31**, and the cover portion **32** is of such width as to fit between the bent-up sides of the back portion **30** when the seal is closed. The folding flap **33** is provided with a reinforcing rib **43** while the transverse notch or aperture **44** provided in the knee area where the flap **33** joins the cover portion **32**, restricts the bending to the weakened zones **45**. For convenience in shipping and handling, the seal of FIGS. 5–7 as also that of FIGS. 1–4, may be furnished flat so that the flap **33** is in the same plane as the other portions, whereby it will bend over into the attaching operation as shown in FIG. 5. The folding tab **34** is provided with a transverse aperture **46** of sufficient width that the tongue or folding flap **33** can pass therethrough. Lateral notches **47** in line with the aperture **46** confine the bending to take place in the narrow zones **47'**, **47'** between the apertures **46** and the notches **47**.

To assemble the seal to a cord or simliar tensile member, the body and cover portions are bent along scores **39** and **40** after the cords have been placed adjacent the neck portion **31**. The tongue or flap **33** is then brought into alignment with the aperture **46** and is inserted completely to such an extent that the body portion **30** and the cover portion **32** are in contact with each other, and the cord **48** is securely clamped between the lateral teeth. To lock the seal, the tongue or flap **33** and the tab **34** are then jointly bent backwards as shown in FIG. 7, this operation being the same as described for FIG. 4. Since the folding flap **33** has to be bent initially clockwise by 90° as viewed in FIG. 5 and has to be bent thereafter through 270° to arrive at the position illustrated in FIG. 7, a bending through 360° is again necessary for the complete installation of the seal. Since additionally the flap **33** has to be bent through 180° to remove the seal, it is obvious that this seal is also completely tamper-proof.

The embodiment of FIG. 8 illustrates a hasp seal similar to FIGS. 1–4, in which corresponding parts are designated by the same reference numerals of the 100 series. However, in contrast to the embodiment of FIGS. 1 through 4, the main body of the seal of FIG. 8 is formed of two substantially oppositely directed body portions **111** and **112**, which are disposed adjacent one another in the longitudinal direction of the sheet material. A folding flap or tongue **110** is bent substantially at right angle to the main body portion **111** while notches **118** and aperture **118'** are provided within the area

where the folding flap **110** adjoins the main body portions **111** for purposes of confining the bending stresses to this area. The folding flap **110** as well as the main body portion **111** may be provided with reinforcing ribs **117** and **119**, respectively. The upper, free end of the main body portion **112** is provided with a folding tab **116**. The area of connection of the folding tab **116** with the main body portion **112** is also provided with an aperture **114** and with notches **115** so as to facilitate bending of the tab **116** and confine the bending stresses to this area.

If desired, the main body portion **111** may also be provided with steps, such as steps **120** and **212**. Additionally, if so desired, a tongue portion **122** of any appropriate shape may be sheared or punched out of the area of connecting of the sheet material between the portions **111** and **112** for purposes of marking of identification or to affix thereon a sheet, tab or the like. At the same time, the aperture **122'** will facilitate bending of the portions **111** and **112** during assembly of the seal when the folding flap **110** is inserted into the aperture **114** prior to the approximately 270° rotation thereof in the counter-clockwise direction to lock the seal. Since the operation of the seal is otherwise identical with the embodiment of FIGS. 1 through 4, a further description is dispensed with herein. The advantage of the embodiment of FIG. 8 is simplicity in manufacture, in particular when steps **120** and **121** are omitted and when no tongue **122** is sheared or cut out of the sheet material. However, this advantage is offset by the increased material requirements over those of FIGS. 1 through 4.

FIG. 9 illustrates a hasp seal similar to FIGS. 7 and 8 which utilizes the present invention with a type of seal as described in the U.S. Pat. 2,965,401. The hasp seal of FIG. 9 comprises a central loop body portion **212** passing over into two leg portions **212'** and **212''** which are adjoined by a folding flap tongue **210** and a folding tab **216**, respectively. A transverse slot or aperture **214** and laterally disposed notches **215** are provided within the area of connection of the folding tab **216** with the leg portion **212'** to facilitate bending or folding of the tab **216** within this area. The folding flap or tongue **210** has a central reinforcing or stiffening rib **217** while a transverse slot or aperture **218** is provided within the area connecting the folding flap **210** with the leg portion **212'** of the central body portion **212** so as to confine and concentrate the bending stresses to the narrow zones **218'** of this connecting area disposed to both sides of the aperture **218**. The central body portion **212** is provided with a scored area **219** which breaks upon the occurrence of predetermined stresses within the area as described in the aforementioned patent.

The operation of the seal of FIG. 9 is similar to that described in connection with the other embodiments. To close the shackle seal, the folding flap **210** is inserted through the complementary rectangular slot **214** until the shoulders formed by the transition from the folding flap **217** of reduced width to the leg portion **212'** abut against the inside surface formed between aperture **214** and notches **215**. Thereupon, the flap **210** and the tab **216** are jointly bent over backwards, i.e., clockwise as viewed in FIG. 9, whereby the tab **216** is bent approximately through 180° while the flap **210** has to be bent through approximately 270° about an imaginary axis within the zones **218'**, **218'**. Since the flap **210** is originally bent 90° out of the plane shown in FIG. 9 and thereupon bent in the opposite direction 270° when closed, the total bending necessary for closing the seal is approximately 360°. In case of attempts to tamper with the seal, the flap **210** has to be bent in the counterclockwise direction as viewed in FIG. 9 through about 180°, thereby causing reliably failure within the zones **218'**, **218'**. Since the weakening of the material within the zones **218'**, **218'** can be readily determined, and the flap **210** has to be folded initially through 360° to install the seal, the need for a further 180° folding or bending again assures failure of the material within the zones **218'**. As to the rest, this seal operates in a manner analogous to that described in the aforementioned U.S. patent.

While it will be apparent that the preferred embodiments of the present invention disclosed herein are well calculated to fulfill the objects above cited, it will be appreciated that the present invention is not limited to the details shown and described but is susceptible of numerous changes and modifications as known to a person skilled in the art, and we therefore do not wish to be limited to the details shown and described herein, but intend to cover all such changes and modifications.

We claim:

1. A tamperproof sealing device fabricated from a single piece of sheet material, comprising a main body means, including a folding tab at one end thereof and a folding flap formed by at least a portion of said main body means, wherein the area of connection between said folding tab and the remainder of said body means includes an aperture capable of receiving said folding flap inserted therethrough, wherein said folding flap is bent into an orientation wherein it forms an angle of approximately 90° relative to the remainder of said main body means in order to be inserted through said aperture, said folding flap, having been inserted through said aperture, being bent, in the direction opposite that of the first-mentioned bend, through an arc of approximately 270° to a sealed position, said folding tab being simultaneously bent by entrainment with the folding flap through approximately 180° of said arc, and further including means for confining the bending stresses resulting from the bending of said folding flap to the area where said folding flap adjoins said main body means, wherein, with said folding flap in said sealed position, it cannot be withdrawn from said aperture until said flap has been bent, in the direction of said first-mentioned bend, through an arc of approximately 180°.

2. A sealing device as claimed in claim **1**, where said main body means includes a central body portion and a loop portion, and reinforcing means in said folding flap and in said central body portion.

3. A sealing device as claimed in claim **1** where said main body means includes a back portion and a cover portion, said back portion and said cover portion having up-bent toothed sides for securely gripping a fastening element, a neck portion intermediate said back and cover portions, said neck portion having up-bent toothed sides to assist the toothed sides of said back and cover in gripping a fastening element, and a reinforcing means in said folding flap to restrict the bending of said flap to the weakened area where it joins said cover portion.

4. The construction according to claim **3**, further including a tag secured to said back portion.

5. A sealing device according to claim **1**, wherein said confining means includes a material section of reduced area.

6. A sealing device according to claim **5**, wherein said section of reduced area includes apertured means.

7. A sealing device according to claim **6**, wherein said confining means includes reinforcing means in said main body means.

8. A sealing device according to claim **6**, wherein said confining means includes reinforcing means in said folding flap.

9. A sealing device according to claim **6**, wherein said confining means includes reinforcing means in said main body means and in said folding flap.

10. A sealing device according to claim **9**, wherein said main body means includes a central body portion connected with said flap and a loop portion connected with said tab.

11. A sealing device according to claim **1**, wherein said main body means includes a central body portion connected with said flap and a loop portion connected with said tab.

12. A sealing device according to claim 1, wherein said area where said folding flap adjoins said main body means includes a material section of reduced area, including apertured means.

13. A sealing device according to claim 1, wherein said confining means includes reinforcing means in said main body means.

14. A sealing device according to claim 1, wherein said confining means includes reinforcing means in said folding flap.

15. A sealing device comprising main body means of sheet material and having a folding flap extending at an angle from the main body means near one end thereof insertable through a transverse aperture in said main body means at a place spaced from said folding flap in the longitudinal direction of said sheet material, a folding tab extending at the other end of said main body means, and tamper-proof sealing means including said folding flap as well as means confining bending stresses caused by bending of said folding flap to a predetermined area in the connection between said folding flap and the main body means to form a weakened joint, for sealing the sealing device in a tamper-proof manner only upon rotation of said folding flap as a whole forward of the weakened joint through an angle of about 270° into substantially the plane of said main body means after insertion thereof through transverse aperture.

16. A sealing device according to claim 15, wherein said main body means and said means for sealing the free ends are an integral structure fabricated from a single piece of sheet material.

17. A sealing device according to claim 15, wherein said transverse aperture is spaced from the corresponding

free other end of the main body means, thus forming said folding tab entrained by said folding flap during said rotation.

18. A sealing device according to claim 17, wherein said means for confining the bending stresses includes aperture means where the entire thickness of portions of the sheet material are removed within the area of the connection of the folding flap with said main body means.

19. A sealing device according to claim 15, wherein said means for confining the bending stresses includes perforation aperture means where the entire thickness of portions of the sheet material are removed within the area of the connection of the folding flap with said main body means.

References Cited

UNITED STATES PATENTS

1,140,133	5/1915	Edgar III	292—315
1,152,143	8/1915	Brooks	292—307
1,234,739	7/1917	Edgar	292—315
1,738,252	12/1929	Keidel	292—307
1,847,552	3/1932	Brooks	292—307
2,645,514	7/1953	Mitchko	292—307
2,628,116	2/1953	Edgar	292—315

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U.S. Cl. X.R.

24—30.5; 292—315