May 14, 1968 A. M. HAVLICSEK ET AL 3,383,633

AUTOMATIC QUICK-OPENING WAVEGUIDE CLOSURE

Filed May 25, 1966 2 Sheets-Sheet 1

FIG. 1

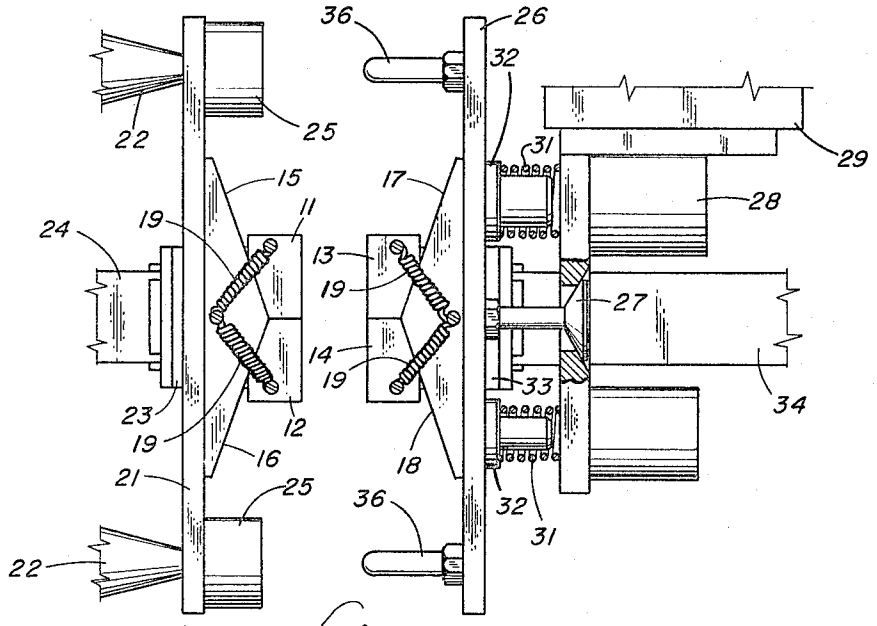
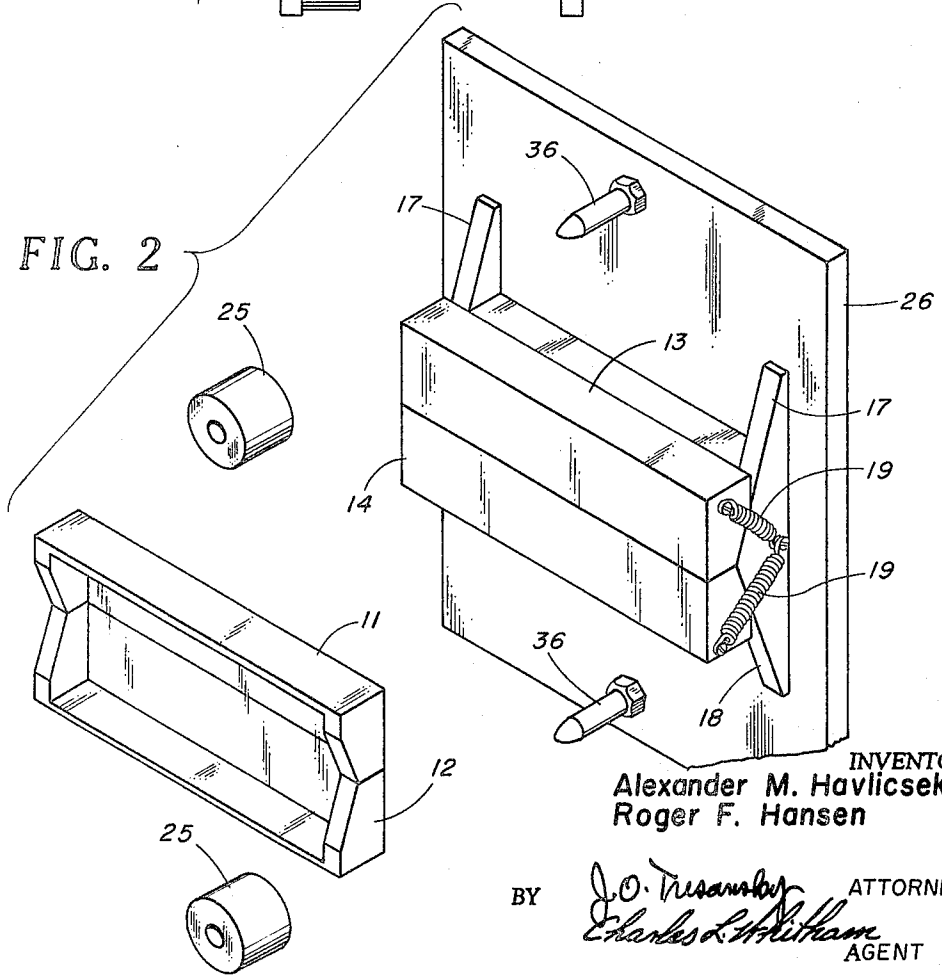


FIG. 2



INVENTORS
Alexander M. Havlicsek
Roger F. Hansen

BY J. O. Tresansky ATTORNEY
Charles L. Hilliam AGENT

AUTOMATIC QUICK-OPENING WAVEGUIDE CLOSURE

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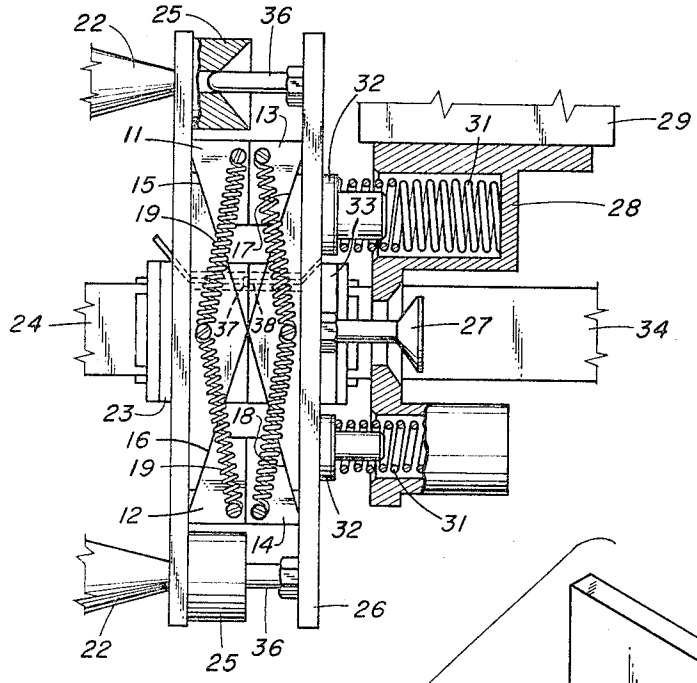
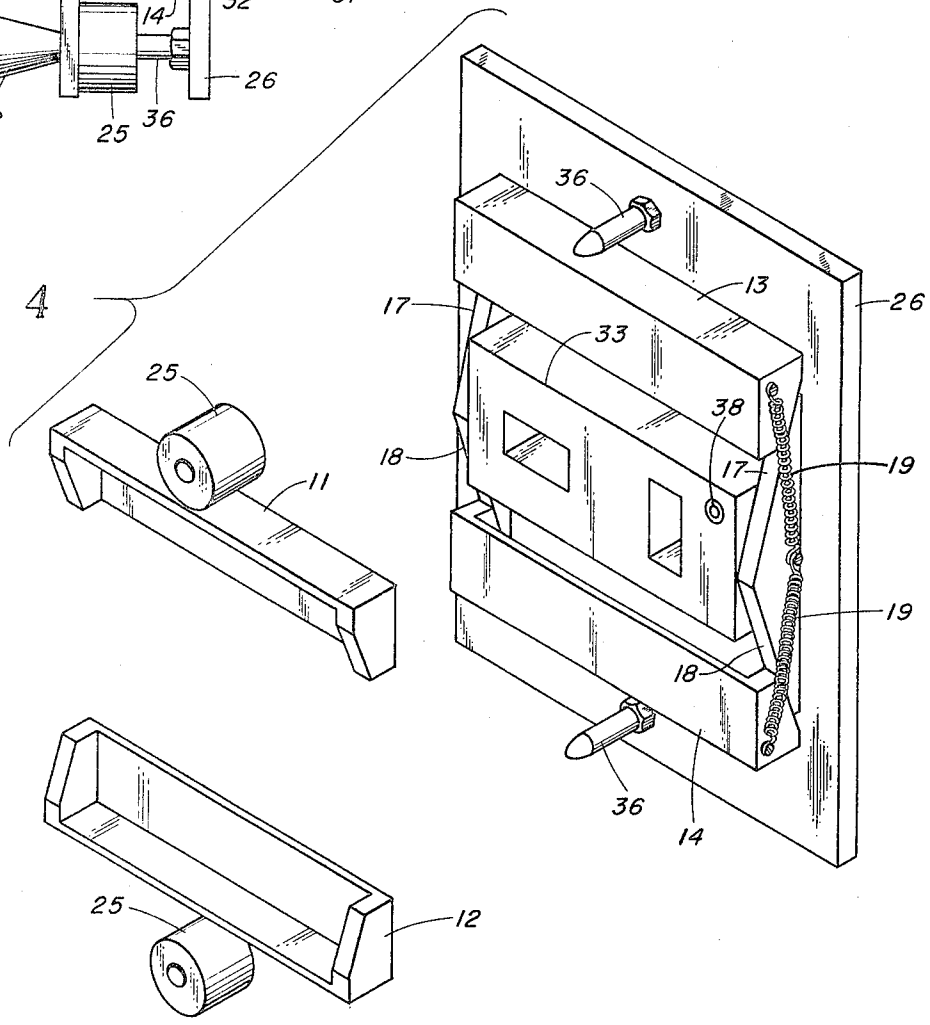


FIG. 3

FIG. 4



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3,383,633

AUTOMATIC QUICK-OPENING WAVEGUIDE CLOSURE

Alexander M. Havlicsek, Linthicum Heights, and Roger F. Hansen, Glen Burnie, Md., assignors, by mesne assignments, to the United States of America as represented by the Secretary of the Navy

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5 Claims. (Cl. 333—98)

This invention relates generally to closure devices, and more particularly to an automatic, quick-opening waveguide closure device useful to prevent contamination of waveguide circuitry when it becomes necessary to "break" the circuitry in a hostile environment. The invention, however, can be used to close any small passage to contamination.

Frontline servicing and maintenance of radar sets, which necessitated opening waveguide circuitry in a hostile environment, is generally undesirable and avoided. If contaminants such as water, dust or dirt driven by wind are permitted to enter the waveguide passages, then harmful arcing and power losses to the radar system will occur. In cases where it is absolutely necessary to open waveguide circuitry, much manual labor is required to remove hardware at waveguide connections, and precautionary procedures are required to cover the waveguide openings.

It is therefore an object of the instant invention to provide a waveguide closure device which can be incorporated at any junction in a radar set and facilitates front line maintenance procedures.

It is another object of this invention to provide an automatic, quick-opening waveguide closure device which is simple, reliable and requires no prior preparation or manual assistance to operate.

It is a further object of the invention to provide an automatic operating closure device useful to close small passages such as air ducts, optical ducts or cable ducts, for example, to airborne contaminants when such passages are opened in a hostile environment.

According to the present invention, the foregoing and other objects are attained by providing two pairs of plastic covers, each pair being positioned to cover a respective face in a break in a waveguide circuit. Each plastic cover rides on a pair of inclined plane tracks such that when the cover is slid to the apex of the tracks it covers half of its respective face of the break. Each cover is biased to this "closed" position. As the faces of the waveguide break are brought together, each pair of covers abuttingly engages the other. When the cover assemblies are further forced together, each of the covers slides on its respective inclined plane tracks, thereby separating in a direction to either side of the center of the waveguide openings and allowing the faces of the break to come into contact. Upon separation of the waveguide interface, the plastic covers of each pair come together automatically thereby closing off and covering the waveguide passages. The device is spring mounted and guided in such a way as to allow proper engagement with both lateral and angular misalignment. In addition, engagement is against a positive spring load which maintains a tight, pressure seal at the waveguide parting line in the joined position.

The specific nature of the invention, as well as other objects, aspects, uses and advantages thereof, will clearly appear from the following description and from the accompanying drawing, in which:

FIG. 1 is a side view, partially in cross-section, of the preferred embodiment of the closure device according to the invention in its closed position;

FIG. 2 is a perspective illustration, partially exploded, of the closure device in its closed position as shown in detail in FIG. 1;

FIG. 3 is a side view, partially in cross-section, of the closure device in its open position with the passage interfaces contacting; and

FIG. 4 is a perspective illustration, partially exploded, of the closure device in its open position as shown in detail in FIG. 3.

Referring now to the drawing wherein like reference numerals designate identical or corresponding parts throughout the several views, and more particularly to FIGS. 1 and 2 which show the closure device in its closed position, the closure comprises four identical plastic covers **11**, **12**, **13** and **14**. Each plastic cover is preferably one-half of a hollow, rectangular parallelpiped open at one of its faces. A pair of covers **11** and **12** or **13** and **14** thus forms a cap or cover when the respective covers of the pair are in their mated position. Each of these covers rides on and is retained in grooves of a respective pair of parallel, inclined plane tracks. Specifically, cover **11** rides on tracks **15**, cover **12** rides on tracks **16**, cover **13** rides on tracks **17**, and cover **14** rides on tracks **18**. Corresponding ones of pairs of tracks **15** and **16** and of pairs of tracks **17** and **18** may be machined in one piece having the form of an isosceles triangle. When each one of a pair of plastic covers **11** and **12** or **13** and **14** is at the apex of its pair of tracks, the covers mate and are in their closed position. Tension springs **19** are provided to bias the covers to their closed positions and to maintain them in tight contact when in these positions thereby promoting an effective seal. As illustrated, the tension springs take the form of small coil springs anchored a one end to the side of the inclined plane tracks and attached at the other end to a plastic cover. Two springs are provided for each cover, one attached at either end. Obviously, other biasing techniques can be used. For example, one hair spring having its body anchored to the common face of corresponding ones of a pair of inclined planes and its ends attached to the ends of mating plastic covers could be substituted for two coil springs. Inclined plane tracks **15** and **16** are fixedly attached to a base plate **21** which is in turn rigidly mounted to supports **22**. Supports **22** may, for example, be a part of the radar case. A waveguide junction **23** passes through plate **21** between each one of the pairs of inclined plane tracks. Junction **23** is welded or otherwise secured to plate **21**. One or more waveguides **24** are bolted to that portion of junction **23** which projects through plate **21** on the side opposite to the side on which tracks **15** and **16** are attached. A pair of alignment funnels **25** are affixed to plate **21** on the side to which tracks **15** and **16** are attached. Inclined plane tracks **17** and **18** are fixedly attached to a second base plate **26**. Plate **26** is spring loaded and is restrained in limited lateral movement by a preload pin **27** which passes through spring housing support **28**. Spring housing support **28** is rigidly mounted to support member **29** which, again, may be a part of the radar case. Two cup-shaped spring housings are formed in support **28** on either side of preload pin **27** and retain coil sprngs **31**. The outwardly projecting ends of springs **31** engage buttons **32** which are attached to plate **26** on the side opposite to the side on which tracks **17** and **18** are attached. Buttons **32** are preferably made of polytetrafluoroethylene to promote easy sliding of the coils of springs **31**. A waveguide junction **33** which matches junction **23** passes through and is welded to plate **26** between each one of the pairs of inclined plane tracks **17** and **18**. One or more waveguides **34** are bolted to that portion of junction **33** which projects through plate **26** on the side opposite to the side on which tracks **17** and **18** are attached. A pair of alignment

pins 36 are affixed to plate 26 on the side to which tracks 17 and 18 are attached and positioned to be in registry with alignment funnels 25 when plates 21 and 26 are brought together.

In operation, when the two plates 21 and 26 are brought together, alignment pins 36 engage alignment funnels 25 and cause waveguide junctions 23 and 33 to line up. The clearance hole in spring support housing 28 through which preload pin 27 passes allows the preload pin to move laterally due to any misalignment. At the same time the broad, forward surfaces of the plastic covers 11 and 13 and of plastic covers 12 and 14 abuttingly engage. As these cover assemblies are forced together, they all silde in the grooves of their respective inclined plane tracks thereby separating in a direction to either side of the center of the waveguide openings. In doing so, the faces of waveguide junctions 23 and 33 are exposed allowing them to come into contact with one another. This condition is shown in FIGS. 3 and 4. The plates 21 and 26 continue to press together, loading the preload springs 31 through buttons 32. This additional spring load insures tight waveguide closure under vibration loading conditions. The plastic cover tension springs 19 are elongated in this condition. An electrical set of contacts 37 and 38 are incorporated in the structure in the vicinity of the waveguide openings in junctions 23 and 33. Contact 37 passes through junction 23 and is electrically insulated therefrom, and contact 38 passes through junction 33 and is electrically insulated therefrom. The contacts are in registry with one another so that they come into contact when the faces of junctions 23 and 33 contact in proper alignment. By using a simple eletcrical continuity test circuit (not shown) connected to contacts 37 and 38, contact and proper alignment of the faces of junctions 23 and 33 can be verified.

When plates 21 and 26 are separated, tension springs 19 pull the plastic covers 11 and 13 and the plastic covers 12 and 14, whose broad surfaces are still in contact, toward the center of the waveguides. As the waveguide junction interface separates, the plastic covers continue to come together until the mating plastic covers 11 and 12 and the mating plastic covers 13 and 14 are in close

contact with each other thereby closing off and covering the waveguide passages of the waveguide system.

It will be apparent that the embodiment shown is only exemplary and that various modifications can be made in construction and arrangement within the scope of the invention as defined in the appended claims.

We claim as our invention:

1. An automatic-operating closure device useful to close small passages to airborne contaminants when such passages are opened at a break in a hostile environment comprising:

two pairs of covers, each pair being positioned to cover a respective face in the break in the passages to be covered, and

four pairs of parallel, inclined plane tracks, each of said covers riding on a respective pair of said tracks such that when each one of a pair of said covers is slid to the apex of its respective pair of tracks the covers mate and are in their closed position, each pair of covers abuttingly engaging the other when the faces of the break in the passages are brought together, each of said covers sliding on its respective tracks as the faces of the break are forced together thereby separating to either side of the passages and allowing the faces of the break to come into contact.

2. A closure device as recited in claim 1 further comprising means for resiliently and yieldingly biasing said covers in their closed position.

3. A closure device as recited in claim 2 further comprising means for aligning the faces of the break as they are forced together.

4. A closure device as recited in claim 3 further comprising means for resiliently supporting at least one of the faces in the break.

5. A closure device as recited in claim 4 further comprising means for verifying the contact of the faces of the break in proper alignment.

No references cited.

HERMAN KARL SAALBACH, *Primary Examiner.*

L. ALLAHUT, *Assistant Examiner.*