United States Patent

[11] **3,559,691**

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[33] **Germany**
[31] **D 53,659**

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[54] **CASING FOR THE RECEPTION OF AIR FILTERS**
9 Claims, 10 Drawing Figs.

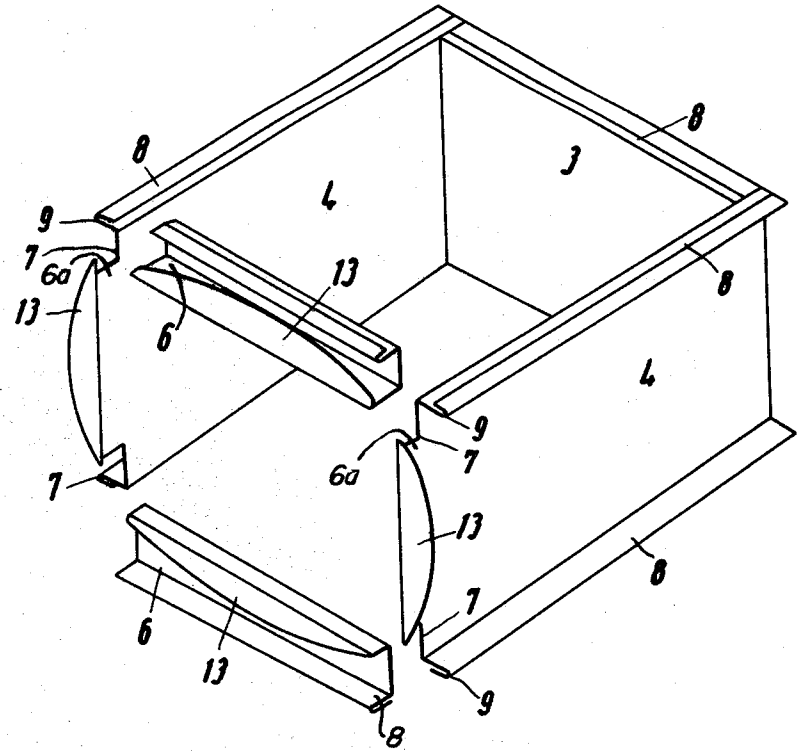
[52] **U.S. Cl.** **138/92,** 98/114; 138/109; 220/3.8, 220/62; 285/121
[51] **Int. Cl.** **F16s 45/00**
[50] **Field of Search** ..... 138/92, 109; 220/3.8, 62, 46(Cursory), 3.2; 285/424, 121; 52/221; 55/R.A.F. (Digests), F.F. (Digest); 98/114; 137/583(Cursory), 584(Cursory); 174/50

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ABSTRACT: Casings for air filters for use in nuclear plant should have the minimum of weld joints to ensure gas-tightness. The invention provides a form of construction requiring only about a quarter of the welding normally required, and furthermore allows lighter gauge metal to be used, by forming three sides of the open ended casing from a single sheet of metal, which is bent and flanged to the required shape, the remaining flanges being welded onto the bent integral part.



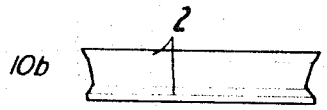


Fig. 3

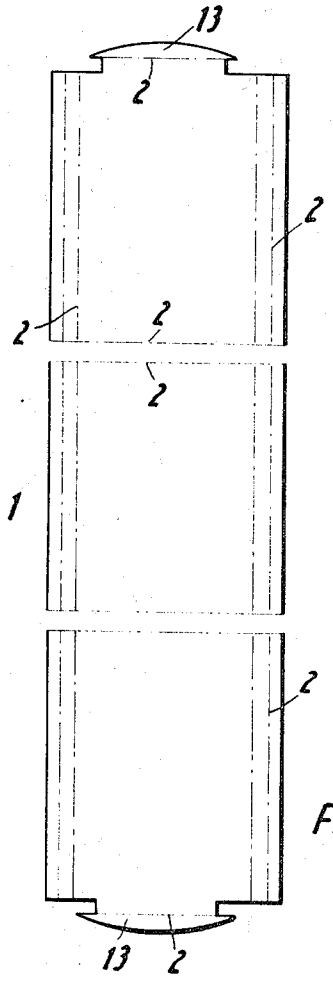
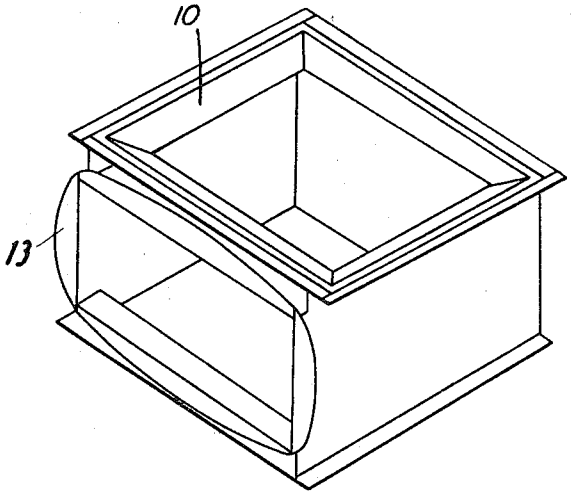


Fig. 1

Fig. 5a



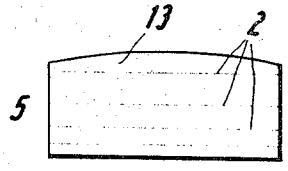


Fig. 2

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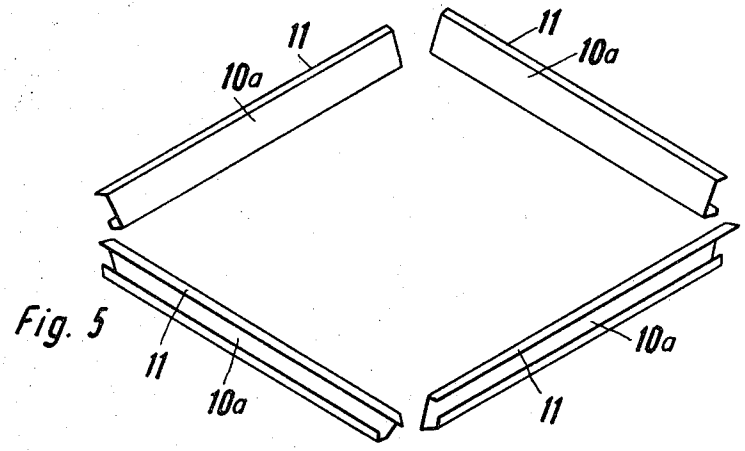


Fig. 5

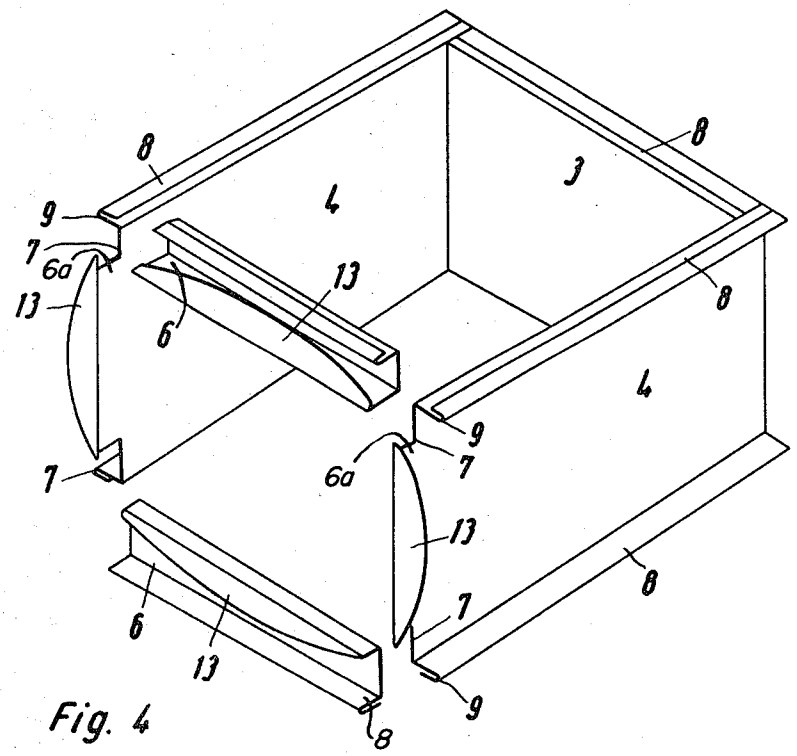


Fig. 4

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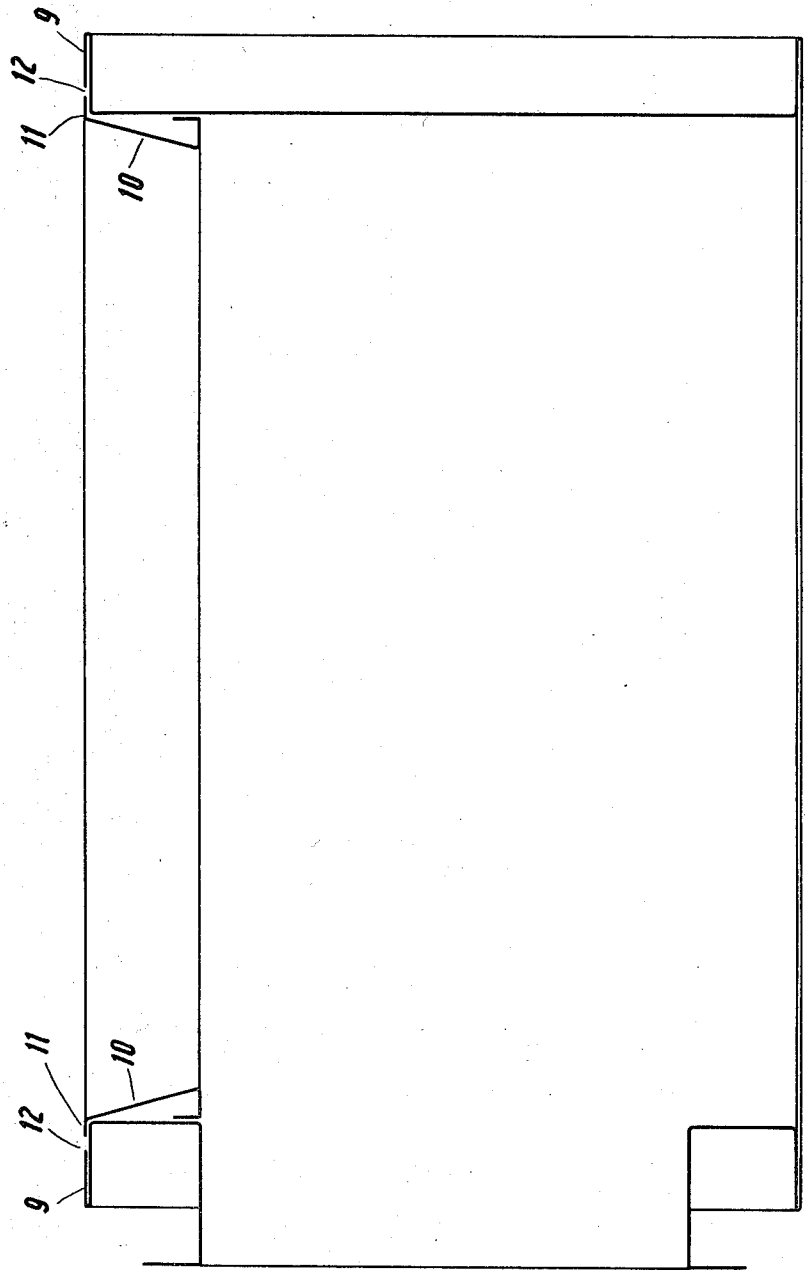


Fig. 6

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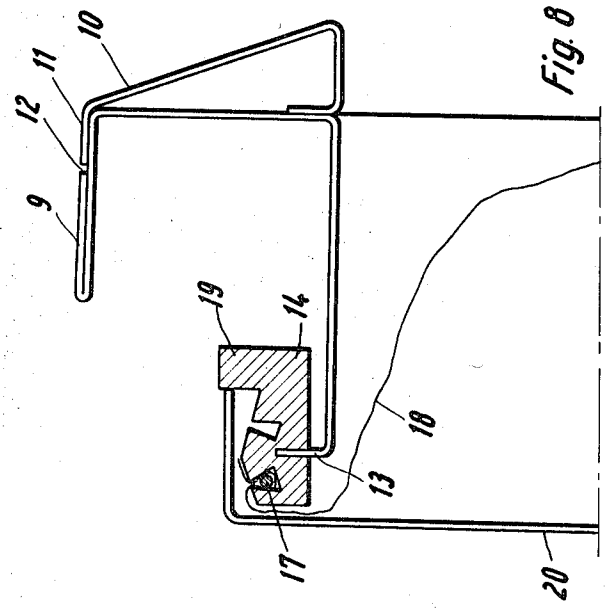


Fig. 8

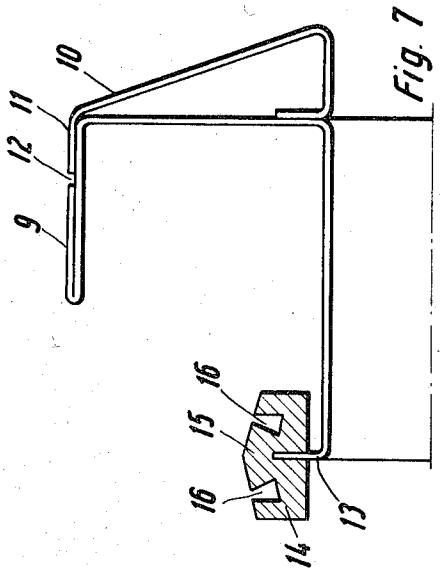


Fig. 7

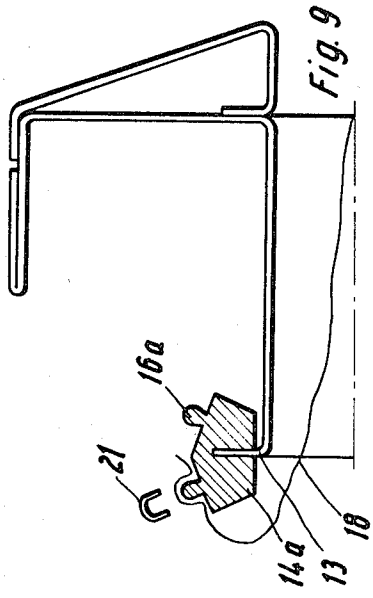


Fig. 9

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CASING FOR THE RECEPTION OF AIR FILTERS

This invention relates to a casing for the reception of air filters, and which is suitable for use in nuclear plant.

In nuclear engineering highest standards are required for the efficiency and performance of air cleaning equipment for filtering out radioactive materials suspended in air.

Similar standards apply to casings for containing such filters, and to the steps involved in decontaminating and replacing radioactively polluted and spent filter packs in the casings. The casings for air filter cells must be fully gastight so that deposition of radioactive dust inside the casing, particularly on the contaminated air side, are reduced to a minimum. Thus projections, edges and like surfaces where dust is likely to collect must be completely absent, and flanged edges and sealing faces must be absolutely smooth to prevent secondary air from entering or leaving at any point. Moreover, the construction must permit several casings in the form of filter cells, to be combined in larger filter units by methods of assembly involving only welding or screwing. At the same time the replacement of contaminated filters by fresh filter packs, should involve a minimum time coupled with maximum safety against radiation hazards.

Casings hitherto used are expensive to construct and are cumbersome to construct. Such casings are welded together from numerous sheet metal parts of considerable gauge to avoid welding distortion. Moreover, weld seams of considerable overall length must be produced and it is by no means simple to ensure that all these seams are completely gastight.

The present invention provides a casing for air filters which avoid the shortcomings of known devices, which has been constructed with a minimum of weld seams and which has flat jointing and sealing surfaces. The open side of the casing for the insertion therethrough of filter packs is contrived so that the replacement of the filter packs is easily and quickly accomplished without danger.

The invention consists of a casing for an air filter, comprising a rectangular open ended box having:

1. a back;
2. two sides;
3. a front having an aperture for the introduction therethrough of filters into the filter casing, each of the sides of the said aperture having a skirting member facing externally of the casing,
4. a flange member on each of the edges of the two open ends of the casing, in which the said back (1), two sides (2), two oppositely-disposed skirting members of the aperture on the front (3) and three of the four flange members (4) on each of the two open ends of the casing are formed integrally from a single flanged and bent metal strip, and the two remaining skirting members of the aperture in the front (3) and associated portion of the said front, and the associated flange member (4) are each formed from a welded and bent metal blank welded onto the said integral part of the casing.

A casing according to the invention can be produced merely with very short weld seams for attaching the two skirting to complete the face of the casing.

The flange members of the top and bottom edges of the casing are preferably doubled by bending back the edges of the flange at least half the width of the final flange. The rigidity of the casing is thereby improved. The flange members, particularly doubled flange members, allow for the assembly of several casings in a composite unit. A connecting sealing frame for connecting the casing to a dust conveying air, dust-laden air or the like may likewise be welded together from bent and flanged strip metal blanks. The flange of such a connecting frame may then be seam or spot welded to the flange members of the casing, preferably in such a way that the edges of the bent over flanges of the open ends of the casing abut corresponding edges of the flanges of the sealing frame. A flat jointing surface is thereby created which prevents secondary air leakage when the casing is connected to or assembled with other parts.

The described form of construction of the casing involves welding work along seams which in length amount to only about one quarter of the length of the weld seams needed in corresponding casings of similar size of conventional type. Thermal expansion and stresses are therefore so small that the guage of the sheet metal used need be only about a third of that otherwise necessary. Hence a completely gastight casing can be provided with a minimum expenditure in material since the extremely short weld seams can be made airtight without any trouble.

The skirting members at the front of the casing are formed with lips which together form an elliptic rim surrounding the aperture through which the filter is to be inserted. A tensioned self-sealing slotted ring of rubber, plastics or like sealing material is fitted around the elliptic rim. The said sealing ring may be provided with a dovetail groove. The purpose of the dovetail groove is to receive a rubber securing ring for securing a safety bag for handling the filter. Alternatively the safety bag may be secured to the sealing ring by clamping the safety bag over projections thereon. Moreover, the rubber ring may conveniently be formed with an annular extension which serves as a seal for a hinged casing cover. The described conformation of the face of the casing which is feasible because of the proposed construction of the body of the casing permits the filter to be quickly renewed without danger.

A particular embodiment of the invention is hereinafter described and illustrated in the accompanying drawings, of which:

FIGS. **1**, **2** and **3** illustrate the shape of the strip metal blanks from which the parts of the casing are made;

FIGS. **4** and **5** are a perspective view showing the construction and assembly of the parts of the casing;

FIG. **5***a* is a perspective view of the assembled casing constructed as shown in the said FIGS. **4** and **5**;

FIG. **6** is a vertical section of the completed casing; and

FIGS. **8** and **9** are cross sections of the top portion of the aperture in the front of the casing, shown on an enlarged scale, showing sealing rings in place.

Referring to the drawings, FIG. **1** is a strip metal blank **1** from which the casing is produced by bending and flanging along the dot-dash lines **2** and thus forming the back **3** and the two sides **4** of the casing (FIG. **4**), the two sides being formed with a skirting member **6***a* at their front edges. The strip metal blank **5** shown in FIG. **2** is used to form a skirting member **6** by bending and flanging the same about the dot-dash lines **2**. Two such skirting members are needed to complete the open face of the casing through which the pack is inserted (FIG. **4**). The two identical skirting members **6** are secured to the integral main part three-fourths of the casing by welding. The weld seams which are needed at **7** are only short and their production therefore results in only minor thermal expansion and stress.

At the same time as the back **3** and the sides **4** are formed from the first blank, they are also provided with flange members **8** as are the skirting members **6**. The flange members are bent back upon themselves across at least half their width, as shown at **9** (FIGS. **7** and **8**). A sealing frame **10** is seam welded or point welded to the said flange members **8**. The sealing frame is built up of four members **10***a* each produced from strip metal strips **10***b* (FIG. **3**) by bending and flanging about the dot-dash lines **2**. The ends of these strips are mitre cut and the abutting ands of the members **10***a* formed therefrom are likewise welded together. The sealing frame **10** is formed with a flanged upper edge **11** of suitable width to fit over that part of the flange of the back and sides of the casing which is not doubled. The edges of the two flanges should abut, as indicated in FIGS. **6**, **7** and **8** at **12**. The reinforced flange formed by the doubled part **9** and by the superimposition of the flange **11** provides a strengthened flat face which is useful for assembling several casings in the form of a stack by welding or bolting them together and creating a completely tight joint.

The sealing frame **10** satisfactorily fits the overall construction and owing to the short length of the weld seams it can be so made that its sealing surfaces are likewise flat and smooth, possibly ground.

The aperture formed by the front of the casing for the insertion therethrough of the filter pack, is surrounded by skirting members **6**, **6***a* integrally formed with lips **13** thus forming a continuous skirt and a framed end opening. Allowance is made for the formation of these lips in the strip metal blanks **1** (FIG. **1**) and **5** (FIG. **2**). When the casing has been assembled the lips combine to form an approximate elliptic rim surrounding the opening in the front of the casing. A rubber or plastics sealing ring **14** is mounted on the elliptic rim formed by the lips **13**. The ring is formed with a slot **15** for the reception of the edge of the said rim over which the ring is stretched to create a tight seal. Moreover, as will be understood from FIGS. **7** and **8**, the ring is also provided with dovetail grooves **16** which permit a handling bag **18** for the removal of a filter pack to be attached thereto for instance with the aid of an endless rubber securing ring **17** which then creates a gastight joint.

As shown in FIG. **9**, the fitted rubber or plastics sealing ring **14***a* has an alternative form of construction, in that it is provided with necked boss-shaped projections **16***a* adapted to be embraced by the protective bag **18** which can then be located by a U-section tensioned ring **21** which creates a tightly sealing joint. The latter ring may be endless or divided and provided with a quick-release self-tensioning shackle.

If the sealing ring **14** is further provided with a ring-shaped extension **19**, the latter may serve as a seal for a hinged cover **20** of the casing.

The casing proposed by the invention consists of a small number of easily produced component parts which can be fitted together with a minimum of welding work. For replacing the filters simple means are provided at the casing opening through which the packs are withdrawn and reinserted, and these means are likewise integrally formed with the principal part of the casing, thereby eliminating the need of welding. Corners and projecting edges, where dust might collect, are avoided.

I claim:

1. An air-filter for a nuclear plant, comprising a rectangular box structure open at both ends and having:

1. a back wall;
2. two sidewalls;
3. an outwardly bent skirting member at the front edge of each said sidewall;
4. an outward flange member on each of two opposite edges of each said wall; the said walls and their flange members and the said skirting members having been formed integrally by shaping and bending a single metal blank; and
5. two further separate outwardly bent skirting members each formed from a separate metal blank and also bent to form a flange member, the said separate skirting members forming with the first said skirting members a framed front opening in the structure and their flange members bridging the front of the sidewall flange members.

2. A casing according to claim **1**, in which the said flange members are doubled by bending back the edges thereof to at least half the width of the final flange.

3. A casing according to claim **2**, which comprises a sealing frame produced by welding together bent and flanged metal strips whose flanges abut the bent-back portion of the doubled flange members of an open end of the casing, and are welded to the said doubled flange members.

4. A casing for an air-filter for nuclear plant, comprising a rectangular box structure open at both ends and having:

1. a back wall;
2. two sidewalls;
3. a skirting member at the front edge of each said sidewall;
4. an outward flange member on each of two opposite edges of each said wall;

the said walls and their flange members and the said skirting members having been formed integrally by shaping and bending a single metal blank, and each said skirting member being a front extension of a said sidewall extending forwardly of the flange members on the said wall and being bent outwardly to provide a lip, and

5. two further separate skirting members each formed from a single metal blank and bent to form a flange member and a lip, the said further skirting members forming with the first said skirting members a framed front opening with the lips forming a front rim facing frontwards and the flange members of said skirting members bridging the front of the sidewall flange members.

5. A casing according to claim **4**, wherein the front rim formed by said lips is of elliptical outer peripheral shape.

6. A casing according to claim **5**, in which a tensioned self-sealing ring is mounted on said elliptically-shaped rim.

7. A casing according to claim **6**, in which the said sealing ring is formed with at least one dovetail groove.

8. A casing according to claim **6**, in which the said sealing ring is formed with at least one boss-shaped projection.

9. A casing according to claim **6**, in which the said sealing ring is formed with an annular extension to provide a sealing surface for a hinged cover for the said casing.