Oct. 10, 1933. H. E. VAN DERHOEF 1,930,138

EXPLOSION VENT

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Fig. 1.

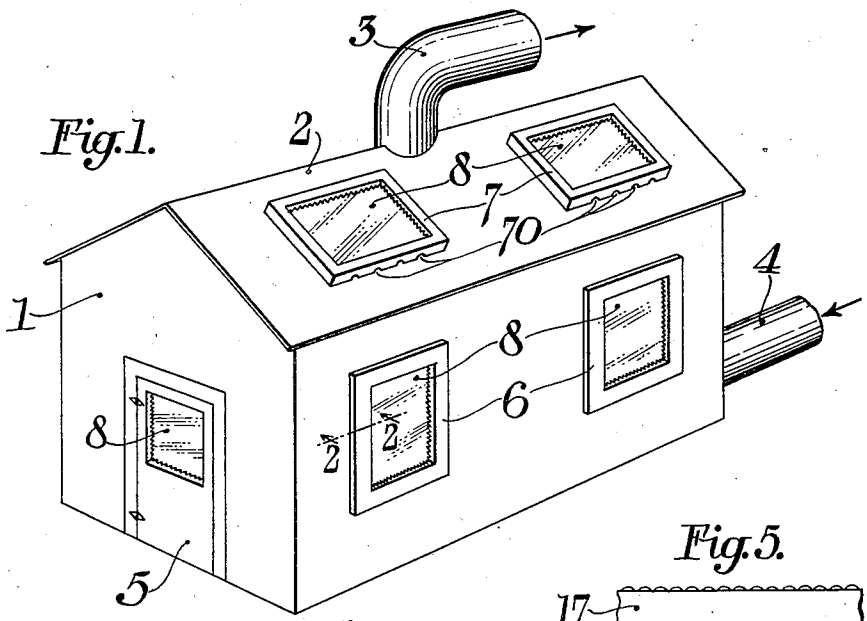


Fig. 2.

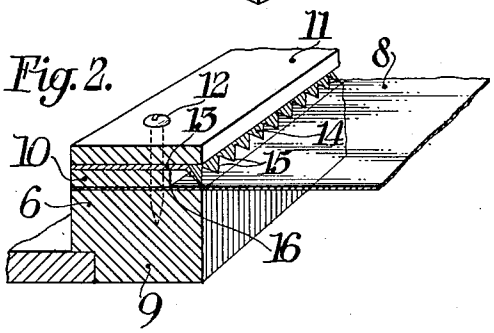


Fig. 3.

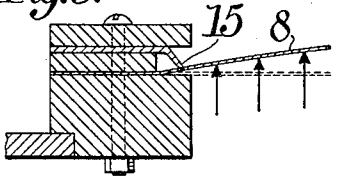


Fig. 4.

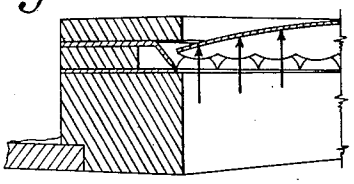


Fig. 5.

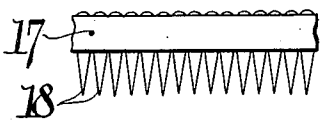


Fig. 6.

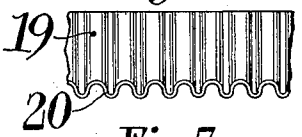


Fig. 7.

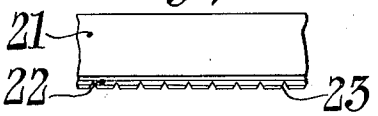
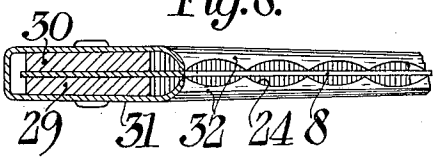


Fig. 8.



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Fig. 9.

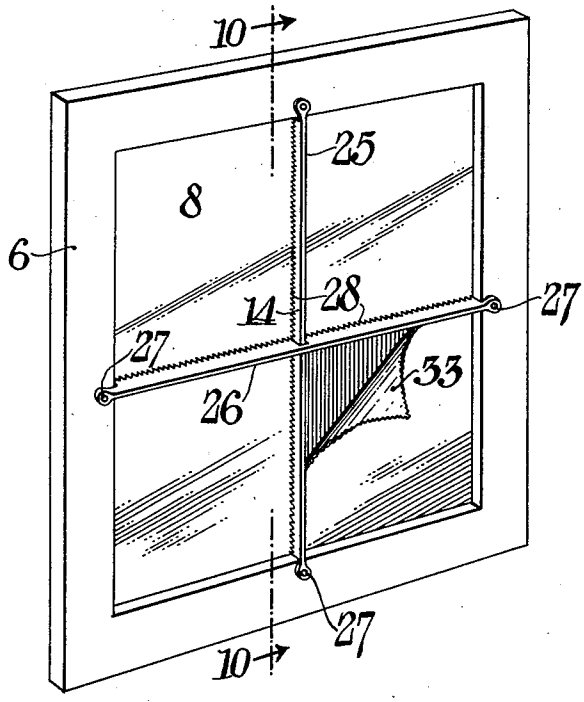


Fig. 10.

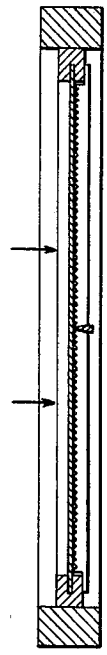
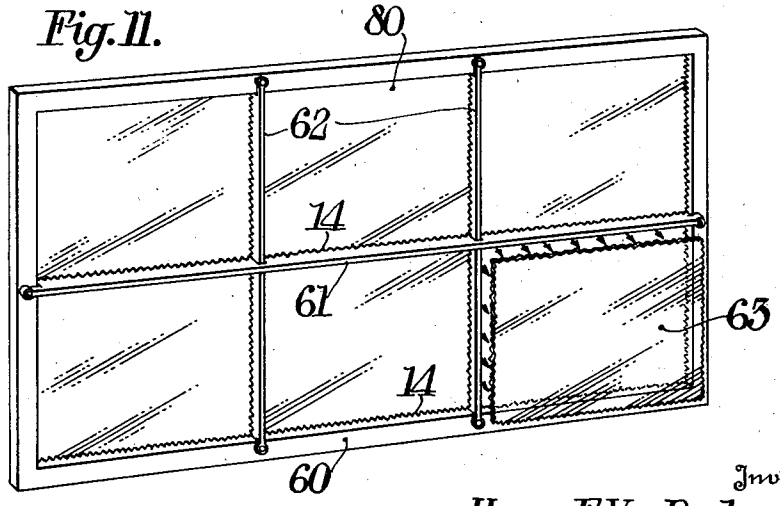


Fig. 11.



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UNITED STATES PATENT OFFICE

1,930,138

EXPLOSION VENT

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Application June 14, 1932. Serial No. 617,139

19 Claims. (Cl. 20—0.5)

This invention relates to explosion windows by which pressure may be quickly relieved in an enclosure or building. One object of my invention is to provide a window through which apparatus may be viewed, the window being provided with a transparent sheet which is rupturable at comparatively slight pressures. Another object of my invention is to provide a rip strip adjacent the transparent window against which the window may rupture itself under the influence of pressure. Another object of my invention is to provide a flexible window adapted to be stretched taut near a fixed series of points in such a manner that when the window flexes under pressure the points will rupture the sheet, permitting quick relief of the pressure in the enclosure. Another object of my invention is to provide a transparent window which will retain the necessary gases in an enclosure and which is flexible, thin and light in weight so that the flying parts of the window will not cause danger. Still another object of my invention is to provide an explosion vent which will require but little pressure from one side to rupture against a series of points and which will require considerably greater pressure in an opposite direction to rupture the window. Other objects will appear from the following specification, the novel features being particularly pointed out in the claims at the end thereof.

Coming now to the drawings wherein like reference characters denote like parts throughout:

Fig. 1 is a perspective view of an enclosure having explosion vents or windows constructed in accordance with and embodying a preferred form of my invention;

Fig. 2 is a perspective view in section taken on the line 2—2 of Fig. 1;

Fig. 3 is a cross section showing on an enlarged scale the flexible window flexing under pressure;

Fig. 4 is a view similar to Fig. 3 but with the window severed from the frame;

Figs. 5, 6 and 7 are fragmentary views in elevation of different forms of severing strips;

Fig. 8 is a fragmentary detail showing of a flexible window support equipped with a double severing strip;

Fig. 9 is a perspective view of a window equipped with severing strips constructed in accordance with a second embodiment of my invention;

Fig. 10 is a section on line 10—10 of Fig. 9; and

Fig. 11 is a perspective view of a window constructed in accordance with still another embodiment of my invention.

In a great many industries there are enclosures or buildings which contain large quantities of volatile solvents or other vapors or solids which are susceptible to rapid combustion and such combustion or explosions do a great deal of damage to the containers or buildings and injuries to workmen are liable to result particularly where it is necessary to provide view openings or windows through which operations may be viewed. Frequently the shattered glass causes more damage than the explosion itself and this is true even where non-shatterable glass is used because the weight of the flying glass is sufficient to cause severe injuries.

In flour mills where there are large surface areas exposed to rapid oxidization such explosions occur. In machines for coating and drying fabrics or in film making machines or in painting or lacquering rooms or other places where large quantities of volatile solvents are present explosions are likely to occur. In order to minimize the danger of such explosions I have prepared a window explosion vent which is sufficiently tight for retaining the gases in the enclosure at the usual or atmospheric pressure but which will readily relieves the pressure if the pressure raises above normal.

I have found, for instance, that with a preferred form of my invention the explosion vents may relieve a pressure of as low as ½ pound per square inch or less, whereas, considerably more pressure is required to operate the usual type of explosion vents such as hinged sealed covers or the like.

As an embodiment of my invention I have shown in Fig. 1 an enclosure which may consist of a rectangular housing 1 having a roof 2 from which a pipe 3 leads, this pipe carrying off fumes created in the enclosure, there being a pipe 4 conducting fresh air into the enclosure. This building may enclose a film drying machine or any other machine in which large surfaces are exposed to rapid oxidization or volatile solvents must be carried off.

The building may be provided with a door 5 and a series of windows 6 through which the operation of the machine may be viewed. If desired skylights may also be provided.

The door, windows and skylights all contain a window explosion vent, that is, they contain openings covered by transparent sheets 8 which are flexible, thin and light in weight.

The nature of the transparent sheetings may be varied to suit the particular work in hand. I prefer to use some thin cellulosic sheeting such as, thin cellulose nitrate or cellulose acetate. It is preferable, of course, to select a sheeting which

cannot be dissolved by the solvent vapors which the housing is to contain.

In accordance with my invention I prefer to provide a frame across which a thin flexible sheet 8 may be stretched tightly so that it lies approximately in a plane.

For instance, as shown in Fig. 2 a window 6 may consist of a frame member 9 supporting a thin sheet of flexible material 8 by means of frames 10 and 11 which may be fastened together in any suitable manner as by screws or bolts 12. Between the frames 10 and 11 there is mounted a strip 13 having a series of bent down teeth 14 forming a severing strip for the flexible sheet. It should be noted that the severing strip 14 has a plurality of sharp teeth 15 closely approaching the plane of the sheeting 8 but normally lying slightly out of contact with the sheet. This severing strip preferably extends around the entire window frame although, of course, it may be applied either around one or more edges of the frame or it may be applied as shown in Figs. 9 to 11 across any portion of the sheeting 8 desired. It is, however, preferable to space the sharp points 15 some distance from the edge 16 which clamps the sheeting in place so that the sheeting will have a chance to flex when the pressure in the enclosure 1 becomes too great.

It is not material just how the severing strip 14 is formed so long as there is a plurality of sharp points or cutting edges against which the sheet 8 may become ruptured and torn out.

In Fig. 5 I have shown a bar 17 with a plurality of sharp points 18 in place of the "saw-tooth" severing strip 14 shown in my preferred embodiment in Fig. 2.

In accordance with Fig. 6 a corrugated strip with sharpened rounded edges 20 may be used for a severing strip and in Fig. 7 a blade 20 having sharpened edge 22 notched at 23 may be used.

I have found, however, that a roughly cut metal edge having points 24 as shown in Fig. 8 serves admirably and such a device is quite inexpensive to manufacture.

As shown in Fig. 2 the transparent window 8 is stretched taut in substantially a plane by means of the cooperating frames 9 and 10. These windows are quite transparent and serve every purpose of the ordinary glass window in retaining the necessary solvents or vapors in the enclosure. When, however, the pressure in the enclosure increases due to improper ventilation or due to rapid combustion or an explosion the transparent sheet 8 as indicated in Fig. 3 flexes outwardly until the sheet is brought into contact with sharp points 15 of the severing means and as the pressure increases the sheet 8 rapidly severs around all four edges as indicated in Fig. 4 blowing through the frame, thus quickly relieving the pressure in the enclosure 1.

It should be especially noted that the transparent sheets 8 which cover the windows are of light weight, flexible, thin material so that they weigh very little and even if one of these sheets should strike a workman no damage would result. Thus one of the chief causes for injuries is eliminated.

A window constructed as above described may be used purely as an explosion vent in which case it is not necessary to make the material 8 transparent.

With a window constructed as indicated in Fig. 2 pressure from the inside will flex the sheet into contact with the sharp points with very little pressure, say around ½ pound per square inch or less. However, pressure from the opposite side of the sheet must be very much greater before the window is damaged, say 2 or 3 pounds per square inch before the sheet will give away since on the opposite side of the window frame the teeth 15 are not provided.

For certain purposes it may be desirable to provide a window which will become readily severed and give away at low pressure in either direction.

In such cases the window shown in Fig. 8 may be used in which the flexible material 8 is clamped between two frames 29 and 30 about which a U-shaped member 31 may be fastened in a suitable manner, the inner edges 32 of this U-shaped member being formed toward each other to form sharp points 24. In this form of my invention pressure on either side of the sheet 8 will cause it to become ruptured on the sharp points and to tear out.

It is natural of course, for a flexible sheet 8 to expand more quickly at the center than at the edges which are confined by the window frame 6. It may, therefore, be desirable to provide a severing means as indicated in Fig. 9 which is in the shape of a cross extending across the center of the window.

In this form a pair of rods 25 and 26 are suitably fastened at 27 to the window frame and are provided with the severing strips 28 which may be provided with any desirable form of teeth 14. When such a window 8 is subjected to pressure each of the severing means 28 will immediately contact with the sheeting when it bulges outwardly under pressure with the result that the sheet will be severed from the center towards the edges as is indicated at 33 where a single section is shown as having been severed to relieve the pressure.

If the severing means 28 extend only across the flexible material and not also around the edges the window will not be completely opened and the flexible material 8 may be retained by a frame 6.

Where it is necessary to vent the enclosure as rapidly as possible the severing means 14 may extend entirely around the frame 60 as shown in Fig. 11 and in addition a suitable number of cross bars 61 and 62 may be provided with sharp teeth 14 so that under pressure the different sections as indicated by the single section 63 may be separately severed. Thus a large window 80 would blow out into a series of small severed sections 63, each of which would be flexible and light in weight and, therefore, harmless.

It is to be understood that the enclosure 1 may either be a complete building in which workmen are employed or it may be a casing or enclosure for a machine located inside of a building. It is, of course, desirable to provide the building itself with a means to permit pressure to readily escape and this means may well be windows constructed in accordance with the above detailed description.

It is to be understood that the particular type of frames must be suited to their particular use as, for instance, it is obvious that skylight frames should be provided with suitable drainage apertures as, for instance, is shown at 70 in Fig. 1 if these windows are to be used out of doors.

It also frequently happens that it is not necessary or desirable to have the windows transparent. The sheeting may accordingly be made colored by adding any of the well known dyes or

pigments, may be made translucent or totally opaque.

Where it is not necessary to have the window transparent, sheetings other than of cellulosic material may be employed such as rubber, impregnated fabric, or other sheeting.

The particular type of sheeting is not material, providing it has the necessary qualities for use with my invention; that is, that it will normally retain vapors, solvents or other readily oxidizable material in an enclosure without undue leakage, that it has at least some degree of flexibility and that it is capable of being ruptured by a rip strip as above described.

I contemplate as within the scope of my invention all such forms as may come within the terms of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A pressure relief vent comprising a frame, a sheet of flexible material stretched across the frame, and means associated with the frame adapted to facilitate rupturing the flexible material when the material flexes under pressure.

2. A pressure relief vent comprising a frame, a sheet of flexible material stretched across the frame, a means associated with the frame including sharp points close to the flexible material adapted to facilitate rupturing the flexible material when it flexes under pressure.

3. A pressure relief vent comprising a frame, a sheet of flexible material stretched across the frame, and means associated with the frame including angularly arranged rows of points close to the flexible material and adapted to facilitate rupturing said material when it flexes towards the points.

4. A pressure relief vent comprising a frame, a sheet of thin flexible material stretched across the frame, a plurality of rows of sharp points spaced from the edge of the frame with the points close to one side of said stretched flexible material whereby flexing of the material under pressure toward the points may rupture the material.

5. A pressure relief vent comprising a frame and a series of fixed points arranged on the frame, a sheet of flexible readily rupturable material mounted on the frame and held thereby in substantially a plane and adjacent said series of fixed points whereby pressure may cause said flexible material to contact and rupture on said points to relieve pressure.

6. A pressure relief vent comprising a frame and a series of fixed points arranged on the frame, a sheet of thin flexible cellulosic material mounted on the frame close to the series of fixed points whereby flexing of the material under pressure may rupture said material and relieve pressure.

7. A pressure relief vent including an opening, a sheet of flexible material covering said opening, a frame supporting said material, and means associated with said frame and rendered operative through the flexing of the flexible material for rupturing the flexing material.

8. A pressure relief device comprising a frame, a thin sheet of readily flexible material covering the frame, and a plurality of prongs normally out of contact with the sheet adapted to be engaged by the sheet when said sheet is flexed whereby said sheet may be pierced by the prongs to relieve pressure.

9. A readily rupturable window comprising a frame supporting a sheet of flexible transparent sheeting, and means carried by the frame adapted to rupture said sheet when flexed.

10. A readily rupturable window comprising a frame supporting a sheet of flexible material in substantially a plane, and means located near the plane adapted to rupture the sheet when it is flexed from its plane.

11. A pressure relief vent covered with a flexible sheet adapted to bulge under pressure, and a cutting device carried by the vent in position to be engaged by the flexible sheet when said sheet bulges.

12. A pressure relief vent covered with a flexible sheet adapted to bulge under pressure, and means fixedly mounted with respect to the vent and having a sharp edge against which the flexible material may bulge and rupture.

13. A window comprising a frame, a sheet of flexible material stretched over the frame, and means on one side of said window adapted to rupture said material when said flexible material flexes.

14. A window frame comprising means for stretching a flexible sheet taut across the opening of said frame, and means spaced from the opening and lying close to the sheet forming a cutting edge.

15. A pressure diaphragm carried by a frame and means on one side of the frame adapted to pierce said diaphragm whereby pressure on one side of the diaphragm may rupture said diaphragm, the other side of said frame being free from said piercing means.

16. An enclosure adapted to contain expansible gases, an opening in said enclosure covered by a flexible sheet of material adapted to flex under pressure and means associated with said sheet for rupturing said sheet when said flexible sheet flexes.

17. An enclosure adapted to contain expansible gases, an opening in said enclosure covered by a flexible sheet of transparent material and means cooperating with said sheet adapted to rupture the transparent material when said material flexes under pressure.

18. An enclosure adapted to contain expansible gases, an opening in said enclosure covered by a flexible sheet of light weight flexible material and means cooperating with said material to sever the material from the enclosure when the said material flexes under pressure.

19. An enclosure adapted to contain expansible gases, an opening in said enclosure covered by a flexible sheet of light weight flexible material adapted to expand and rupture under pressure, and means carried by the closure to facilitate the rupturing thereof.

HENRY E. VAN DERHOEF.