June 29, 1965 L. F. DAVID 3,191,728

METAL PANEL AND ITS APPLICATION IN AN ANTI-BLAST BARRIER IN PARTICULAR FOR AIR-PORTS

Filed Dec. 27, 1961 2 Sheets-Sheet 1

Fig. 1

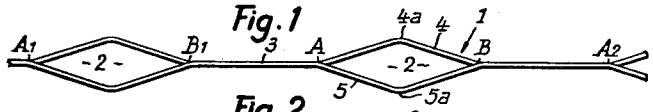

Fig. 2

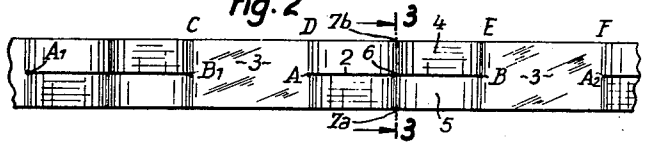

Fig. 3

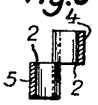

Fig. 4

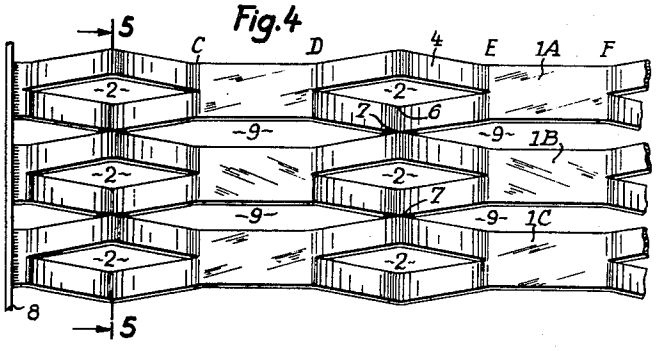

Fig. 5

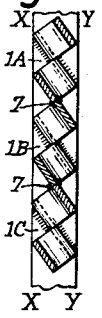

Fig. 6

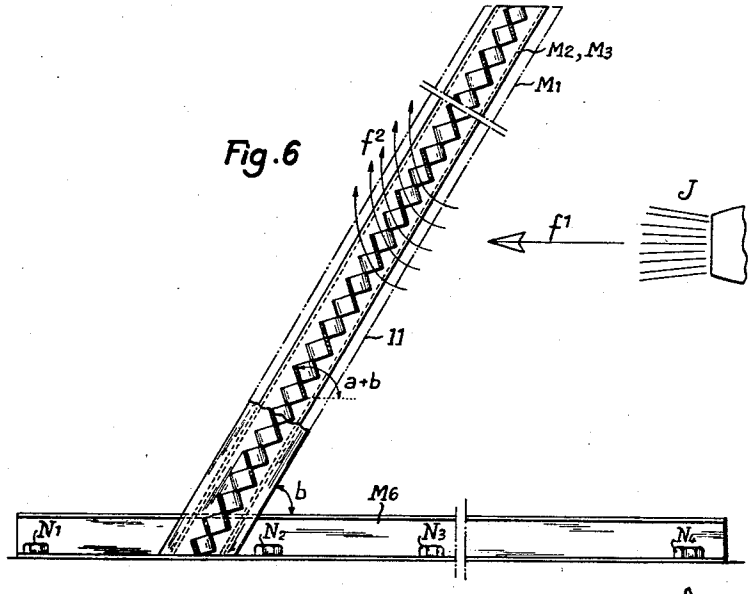

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Fig. 7

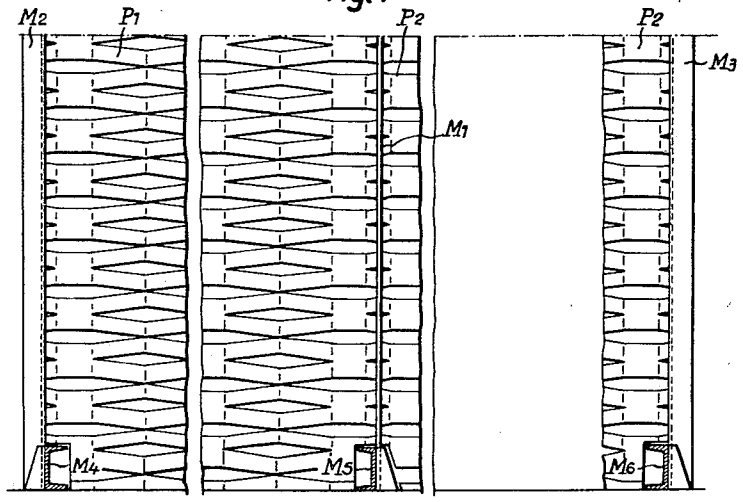
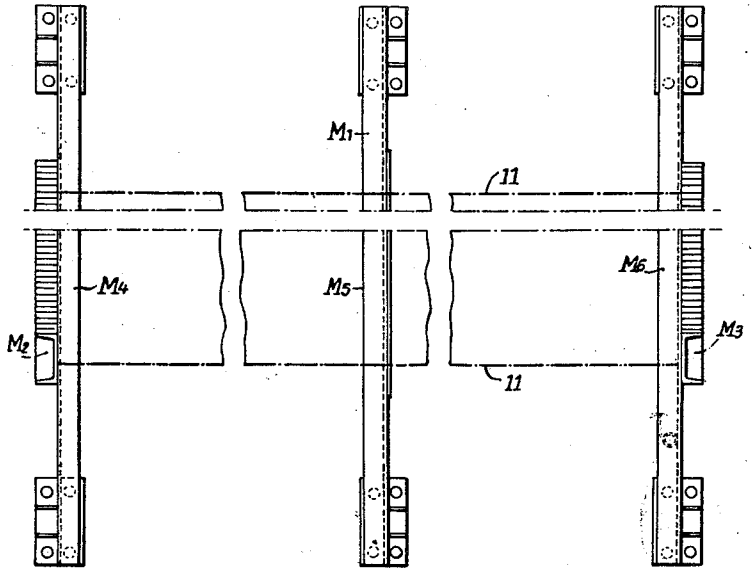


Fig. 8



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3,191,728

METAL PANEL AND ITS APPLICATION IN AN ANTI-BLAST BARRIER IN PARTICULAR FOR AIR-PORTS

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Claims priority, application France, Dec. 29, 1960, 848,360
1 Claim. (Cl. 189—82)

The present invention relates to a metal panel composed of elements assembled by welding.

The panel comprises identical elements each of which elements consists of a metal strip, such as a metal band or sheet, flat plate, this strip being expanded, the expansion being achieved by forming therein longitudinal slits and press-forming in a direction perpendicular to the place of the strip in opposite directions the two portions of the strip separated by said slit so as to form openings having a surface perpendicular to the plane of the strip, said openings having a diamond or like shape and the panel comprising such elements disposed in the same direction in such manner that the mean planes of their unpressed portions are disposed in planes which are parallel and separated by the width of said openings, two consecutive elements being in contact along their outer edges at points located at the apex of the pressed portions and being welded together at these points.

Preferably, all the slits are disposed along the median axis of the strip, have the same length and are disposed a regular distance apart.

In this way panels are obtained all the elements of which are parallel and inclined at the same angle a relative to the general plane of the panel, that is, relative to a plane containing the rectilinear parallel edges of the unpressed portions of the elements.

Therefore, if the width of the strip is L and the transverse dimension of the openings is d, the angle of inclination a is such that

$$\tan a=\frac{d}{L}$$

If a strip 50 mm. wide is used (for example a flat iron plate 50 mm. wide and 4 mm. thick) and openings are formed therein, having a length of 40 mm. in the direction perpendicular to the plane of the strip, the angle a would be about 40°.

These panels possess between the elements separation gaps having a rectangular middle portion and two triangular end portions.

It will be understood that these shapes are approximate, the diamond and triangular shapes could have more or less curved portions, or flat portions of a certain length located at the apices of the curved or folded portions obtained by a press operation. The advantage of these flat portions is that the contact of the edges to be welded together occurs not at a point but along a certain length of the edges.

This panel has the advantage of being apertured to a large extent and yet possesses very great rigidity owing to its overall thickness, that is, the distance between the two parallel planes containing the two faces of the panel. The deflecting surfaces of said strips are greater in area than the openings between said strips.

This rigidity and the presence of many openings and gaps having an oblique direction relative to the plane of the panel render the latter of utility in a large number of applications. For example, this panel could be used in the fields of protection and ventilation and in Venetian shutters. In the hydraulic fields, it could be used also as, for example, a fluid calming grid or a mud separator. A particularly interesting application resides in the use of the panel as an air current rectifier or changer, in particular in anti-blast barriers for air-ports and as wind shields on the flight decks of aircraft carriers.

The jet engines of aircraft operating in the aircraft parking areas produce high-speed jets or streams of gas which could inconvenience the personnel and passengers and could even be dangerous.

The object of the present invention is to provide a barrier which permits upwardly deflecting the gas stream issuing from a jet engine so that this stream no longer constitutes an inconvenience for the ground personnel who are shielded from the jet engine by this barrier even should the aircraft be located at a short distance, for example about 15 metres, from the barrier in a direction perpendicular to the latter.

Another object of the invention is to provide a barrier which not only has the aforementioned advantage but also allows a certain mean visibility therethrough.

The barrier according to the invention comprises panels composed of an assembly of elements consisting of expanded strips of the aforementioned type, said panels being disposed in such manner that the longitudinal sides of the elements are horizontal, said elements being inclined at an angle a relative to the general plane of the panel, and the panel being itself inclined at a certain angle b relative to the ground, whereby the elements have an inclination $a+b$ relative to the ground so that the gas stream from the jet engine is deflected upwardly through the openings and the gaps formed between the elements.

Preferably, the angle that the elements make with the horizontal plane is slightly obtuse. Angles between 90° and 120° have given good results.

Further features and advantages of the invention will be apparent from the ensuing description with reference to the accompanying drawings to which the invention is in no way limited.

In the drawings:

FIG. 1 is a side elevational view of a panel element disposed horizontally;

FIG. 2 is a plan view of this element;

FIG. 3 is a sectional view of this element taken along line 3—3 of FIG. 2;

FIG. 4 is a plan view of a portion of a panel according to the invention having three elements of the type shown in FIGS. 1–3;

FIG. 5 is a sectional view of this panel taken along line 5—5 of FIG. 4;

FIG. 6 is a side elevational view of an anti-blast barrier used as protection from the gas stream issuing from a jet engine;

FIG. 7 is an elevational view of this barrier and its base structure, and

FIG. 8 is a plan view of the barrier and base structure.

In the embodiment shown in FIGS. 1–3, the panel of the invention comprises metal elements such as 1 consisting of a metal strip, such as a metal band, flat plate or sheet having a width L and an optional length. This strip has openings 2 spaced a regular distance apart and optained by forming in the strip and preferably along the median axis thereof rectilinear longitudinally extending slits such as AB, the other slits such as A_1, B_1 being on the same line as the slit AB but separated from the latter by intervals of intermediate plane portions 3 of constant length such as AB_1, BA_2 . . .

A slit such as AB has therefore two lips or sides 4 and 5 constituted by the two halves of the strip. To obtain an element according to the invention, each of these

lips is formed or pressed in opposite directions perpendicular to the plane of the strip, the lip 4 being for example pressed so as to project upwardly of the plane of FIG. 2 and the lip 5 being pressed in the same shape but in a direction to project downwardly from the other side of the strip. These press-formed portions could be bent or folded as shown in FIG. 1 and have apices or corners *4a*, *5a*, but they could also have a shape which is substantially curved, or the corners *4a*, *5a* could be replaced by flat portions of short length. The opening 2 shown in FIG. 3 and which will be assumed to have a diamond shape hereinafter, could therefore have a shape slightly different from a geometric rhombus, the portions 3 separating these openings being flat.

It will be understood that the contour of a diamond such as the diamond 2 is projected on the FIG. 2 along the line A–B, that is, this contour is in the longitudinal median plane perpendicular to the plane of the strip.

Therefore, if such an element is placed on a flat surface which is, for example, horizontal, it will be in contact with this surface, on the one hand, through the medium of the apex 6 of the diamond, and, on the other hand, through the medium of the edges such as C–D, E–F of the flat portions.

Consequently, as mentioned hereinbefore, the flat or plane portions of the strip are inclined relative to the plane on which the element rests.

If identical elements, such as elements 1A, 1B, 1C (FIGS. 4 and 5), are placed on the same plane these elements have their flat portions 3 in parallel relation to each other and are in contact with each other only at points or regions such as 7 corresponding in respect of the element 1A, to a point such as the point *7a* shown in FIG. 2 and corresponding in respect of the element 1B, to a point such as the point *7b* also shown in FIG. 2. The panel according to the invention is obtained by welding the various elements together at these points 7. A panel is therefore obtained which is composed of parallel elements whose flat portions are all inclined at the same angle relative to the planes such as XX, YY containing the two faces of the panel. This panel could furthermore be welded to a bar or plate such as 8 (FIG. 4) or consist merely of the assembly of a number of elements 1A–1B–1C, etc. . . .

The panel has great rigidity despite a large proportion of apertures constituted by the diamonds 2 and the gaps 9 between the elements, since the area of the panel is greater than the area of the openings therein.

FIG. 6 shows a particular application of the invention to an anti-blast barrier 11 provided at an air-port as protection against the gas streams issuing from jet engines, these streams being designated by the reference letter J (FIG. 6) and moving in the direction of arrow f^1.

This anti-blast barrier comprises an assembly of panels according to the invention having such height that the barrier has a vertical height sufficient to protect the passengers and personnel from the gas streams. In most cases a height of about 1.50 m. above the ground is sufficient, but it will be understood that this height can be modified to suit particular requirements and in particular to suit the height of the jet engines above the ground.

These panels have a horizontal length compatible with the possibilities of manufacture and the barrier has a sufficient number of panels for the length of the region to be protected.

This barrier is downwardly inclined relative to the direction f^1 of the gas stream at an angle b with respect to a horizontal plane. This angle b is preferably about 60°. The inclination of the elements relative to the plane of the barrier can vary between certain limits. It has been found easy to produce panels having an inclination of about 40°. Consequently the flat portions 3 (or "air-deflecting bars") of the strips have an inclination which is about 100° relative to the direction of the gas stream.

Thus the stream moving in a horizontal direction impinges on these bars and is upwardly deflected through the openings 2 and gaps 9 as shown by the arrows f^2 (FIG. 6).

Experience has shown that a perfect protection is obtained even in the case of a jet engine disposed at a distance of about 15 m. from the barrier practically the entire gas stream being directed upwardly.

The inclination dimensions are given by way of example and it must be understood that the scope of the invention is not intended to be limited thereby, these dimensions being variable between the aforementioned limits.

However, it is necessary that the total angle $a+b$ be obtuse and definitely exceed 90°. It will be understood that if this angle were too near to 90° the upward deflection would be obtained imperfectly, the barrier would act as a wall and a high pressure would build up against the barrier. On the other hand, if the obtuse angle were excessive the gas stream could still have a horizontal component after having passed through the barrier and the barrier would perform its function in a very imperfect manner. In practice, values between 98° and 120° give very satisfactory results.

The barrier consists of a suitable number of barrier sections each of which comprises a panel such as P_1, P_2 of the type described hereinbefore. This panel could, for example, have a height of about 1.15 m. and a width of about 1.20 m.; each strip could have, for example, 3 diamond-shape openings. The pitch, that is, the distance between consecutive parallel elements could be about 70 mm.

The adjacent panels are interconnected by flat metal strips such as M^1 (FIG. 7) and the end edges of the barrier are secured to U-section members M^2, M^3, welded at their base to U-section members such as M^4, M^5, M^6 which could rest on the ground, or on any suitable base for example of concrete, and are fixed to the ground or this base by anchoring holding-down bolts, such as N^1–N^4.

Although specific embodiments of the invention have been shown in FIGS. 1–5, and specific applications thereof have been shown in FIGS. 6–8, many modifications and changes may be made therein without departing from the scope of the invention as defined in the appended claim.

Having now described my invention what I claim as new and desire to secure by Letters Patent is:

A panel for an air blast barrier comprising a series of elongated strips, each strip having a mean plane and a mean longitudinal axis, the longitudinal axes of said strips being parallel and lying in a common plane which is the median plane of said panel, each strip further having a series of longitudinally extending first portions offset from said mean plane, and a series of longitudinally extending second portions aligned with said first portions transversely of said strip and offset from said mean plane in a direction opposite to that of said first offset portions, said oppositely offset portions constituting offset pairs, said pairs being separated by intermediate plane portions in the longitudinal direction of said strips, each of said offset portions of each pair having an inner edge and an outer edge, the inner edge of each first portion of the pairs defining with the corresponding inner edge of the second portion of said pairs an opening in a plane substantially perpendicular to the plane of said intermediate plane portions, said strips being so disposed in the panel that said intermediate plane portions are parallel with each other and are inclined relative to said median plane, the outer edge of the first portion of each strip being connected, respectively, to the outer edge of the second portion of the adjacent strip, said panel having elongated openings therein between the parallel series of intermediate plane portions, said strips being spaced from each other by said latter openings except at the point of connection, said latter openings partially laterally overlapping

the openings between said offset portions of said offset pairs, the deflecting surfaces of said strips, constituted by said offset portions and said intermediate plane portions being substantially greater in area than that of the adjacent openings, the openings between said offset pairs being staggered with relation to the openings between said intermediate plane surfaces, said panel being constructed and arranged to lie with its median plane at an obtuse angle with respect to an air blast, whereby an air blast impinging upon the surfaces of said strips will be deflected directly into the said adjacent openings.

References Cited by the Examiner

UNITED STATES PATENTS

1,556,063	10/25	Becker	189—82
2,350,412	6/44	Nelson	189—82
2,726,830	12/55	Brown et al.	181—56
2,826,382	3/58	Hayden	181—56
3,072,230	1/63	Gelert	189—82

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