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BLAST FENCE FOR JET ENGINES

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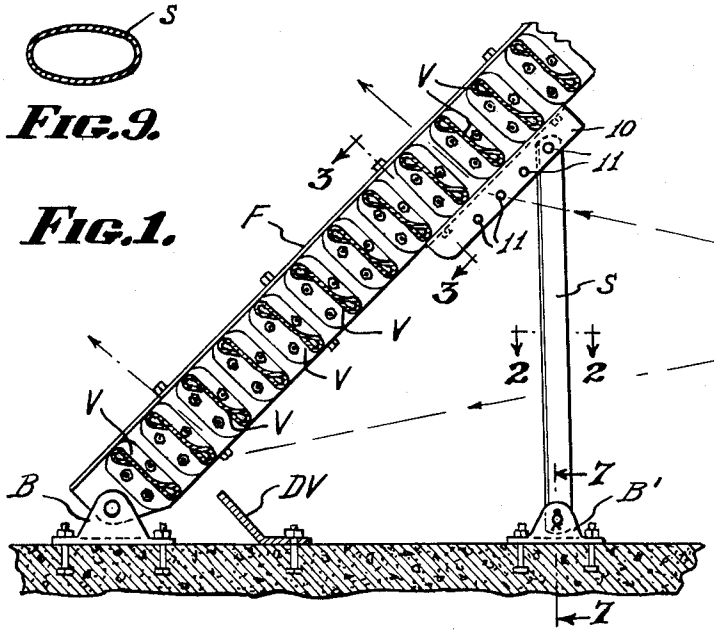

FIG. 1.

FIG. 9.

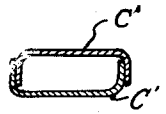

FIG. 2.

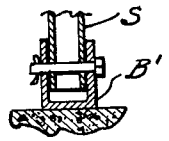

FIG. 7.

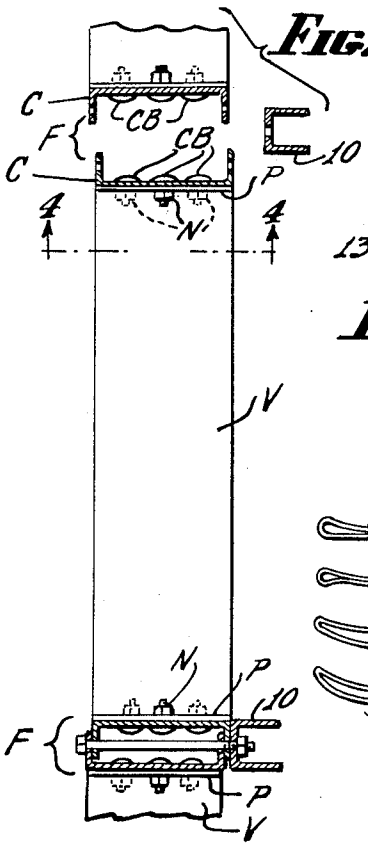

FIG. 3.

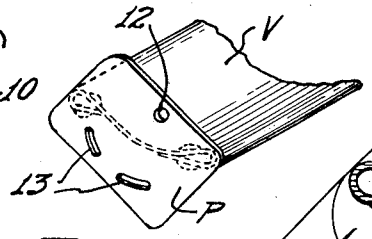

FIG. 5.

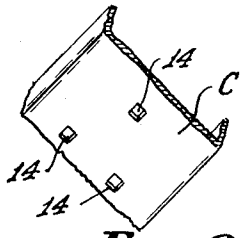

FIG. 6.

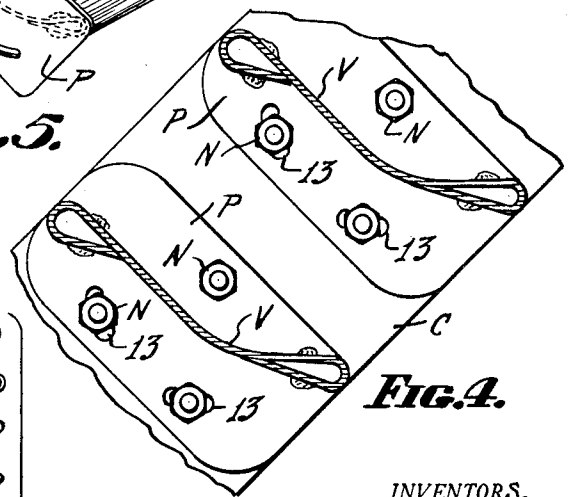

FIG. 4.

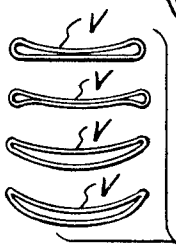

FIG. 8.

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BLAST FENCE FOR JET ENGINES

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12 Claims. (Cl. 244—114)

This invention relates to an improved blast fence for jet engines. The rapid development of jet engines for use in aircraft and other vehicles has created many problems, among the more serious of which is in the nature of a public relations problem. Jet engines create a great amount of noise and the blast from jet engines produces tremendous amounts of dust, heat and smoke.

Steps have been taken to overcome these problems in jet engine plants where special test cells have been built for this purpose. The problem, however, is as great if not greater in and around air fields where the jet engines mounted on the aircraft must be warmed up or tested. Experience has shown that the testing or warming up of jet aircraft on an air field not only creates objectionable noise but also very objectionable dust, smoke and heat problems for people who live near the airport.

It has been proposed to provide blast fences having the general appearance of a slatted lean-to wherein the slats are curved metallic vanes sloping in the opposite direction to the slope of the framework as a whole to direct the blast from the engines upwardly.

It is an object of the present invention to provide a blast fence of the general nature outlined above which is provided with an improved vane structure whereby the vanes are more aerodynamically efficient without, at the same time, being more expensive.

It is another object of the invention to provide frame elements for such a blast fence, which frame members are more aerodynamically efficient than heretofore.

Still another object of the invention is the provision of a blast fence which is anchored to the ground in a pivotal manner and supported by struts which are also anchored to the ground in a pivotal manner whereby, by varying the point of attachment of the struts to the fence, the angle of the fence with respect to the ground may be varied so that, although the fence may be primarily designed for use with a certain type of aircraft, the fence may be adjusted to take care of the blast from aircraft having the jet engines mounted further from the ground.

Ancillary to the above mentioned object, it is yet another object of the invention to provide a fence having vanes which are adjustably mounted so that if the angle at which the fence is disposed is changed, the angle of attack of the vanes may be changed.

A still further object of the invention is to provide a protecting fence which may be used to protect buildings or personnel or equipment from blast effects of all kinds, including the shock waves and radio-active rays of atomic blasts.

These and other objects of the invention which will be pointed out in more detail hereinafter, or which will be apparent to those skilled in the art upon reading these specifications, we accomplish by that certain construction and arrangement of parts of which we shall now describe certain exemplary embodiments.

Reference is made to the drawings forming a part hereof and in which:

Figure 1 is a vertical cross sectional view of a fence according to the present invention.

Figure 2 is an enlarged cross sectional view taken on the line 2—2 of Figure 1.

Figure 3 is an enlarged exploded cross sectional view taken on the line 3—3 of Figure 1.

Figure 4 is an enlarged fragmentary cross sectional view taken on the line 4—4 of Figure 3.

Figure 5 is a fragmentary perspective view of a vane and its pivoting plate.

Figure 6 is a fragmentary perspective view of a channel element to which the vanes are secured.

Figure 7 is a fragmentary cross sectional view taken on the line 7—7 of Figure 1.

Figure 8 shows a series of end elevational views of typical vane cross sections, and

Figure 9 is a view similar to Figure 2 showing a modification.

Briefly, a blast fence to which our invention is directed comprises a plurality of frame members indicated generally at F pivotally secured to the ground and a plurality of strut members S also pivotally secured to the ground and secured in one of a number of positions to the members F. A plurality of vanes V extend between the various members F for the purpose of deflecting the blast upwardly.

The frame members F preferably are composed of a pair of channel elements C disposed with their flanges in interdigitated relation, as best seen in Figure 3. This provides a box beam structure which is aerodynamically more efficient than an I-beam section or an H-beam section.

The strut members S are preferably box-like or tubular, as seen in Figures 2 and 9, and may be composed of a pair of channel elements with their flanges in interdigitated relation, as best seen at C' in Figure 2.

The various frame members F are bolted to the bearing blocks B which are anchored by means of bolts set in concrete or the like and similarly the strut members S are pivotally secured to bearing blocks B' which are likewise anchored by means of bolts set in concrete, all as best seen in Figures 1 and 7.

The upper ends of the struts may be secured to the members F in a variety of ways and by way of example we have illustrated a channel member 10 bolted to the member F and having a number of holes 11 by means of which the strut may be secured to the member 10.

It will be clear that if the upper end of the strut member S is moved to a lower bolt hole 11, the angle of the members 10 with respect to the ground will increase so that the effective height of the fence is increased. Such adjustment is possible because of the pivoted mounting of the members F and S.

The vanes V are secured to the channel elements C as will now be described. A pivot plate P is welded or otherwise suitably secured to each end of each vane. Each such pivot plate P is provided with a pivot bolt hole 12 and one or more arcuate part circular bolt slots 13. The slots 13 are curved on the arc of a circle drawn about the part 12 as a center.

The various channel members C are provided, at intervals corresponding to the desired spacing between vanes, with groups of three square holes 14, as best seen in Figure 6. The vane structures are assembled to the channel members C by means of carriage bolts CB passed through the square holes 14 and thence through the hole 12 and slots 13 of the plate P. Nuts N are then put in place on the vane side of the channels C.

From the foregoing description, it will be clear that if it is desired to adjust the angularity of the vanes with respect to the members F it is only necessary to loosen the nuts N whereupon the various plates P may pivot

about the bolt holes 12 to any position within the slots 13. After adjustment, the nuts N may be tightened to secure the vanes in the desired position of adjustment.

The fence will preferably be composed of units which will be assembled by means of jigs or the like, each unit consisting of a pair of channel members C in back to back spaced relation and connected by the vanes V and their plates P. The units will then be assembled in interdigitated relation by bringing together the channels C of two units and a channel member 10, as seen at the upper portion of Figure 3, and bolting them together, as best seen at the lower portion of Figure 3. The use of carriage bolts is important because after the units are assembled together access cannot be had to the heads of the bolts CB and according to our invention, the adjustment of the vanes can be made from the air side of the structure.

We have shown in Figure 4 a typical vane structure which may be composed of sheet metal wherein the leading and trailing edges of the vanes are curved back upon themselves to provide a fairing.

In Figure 8 we have shown a variety of typical vanes which can be prepared by using metal tubing of appropriate size and passing it through forming rolls or deforming it by means of dies to any of the typical configurations shown in Figure 8. Such vanes may be made quite inexpensively and very rapidly and such vanes will have excellent aerodynamic properties.

It will be understood that when the angularity of the members F with respect to the ground is changed, it may be desirable to adjust the angularity of the vanes to restore it to approximately 45° in order to deflect the blast upwardly, or it may be desirable to adjust the angularity of the vanes to increasingly greater angles with the horizontal from bottom vane to top vane to reduce interference on the exhaust side and to increase dispersion of the exhaust. This may not be necessary in all cases but it is a desirable refinement.

Where the feature of adjustability of the individual vanes is not required, the vanes can be welded directly to the backs of the channel members, whereby the aerodynamic qualities of the fence are still further improved, and the erection of the fence is simplified. In such cases the angle at which the curved vanes are set can be predetermined to provide for efficient change in direction and upward dispersion of both the gases and sound.

In order to make the fence structure still more perfect, we have shown in Figure 1 a deflecting vane DV anchored to the ground to deflect the blast at the ground level up to the elevation of the lowermost vane V. This prevents swirls of dust and smoke from passing under the fence.

It will be understood that numerous modifications in detail will suggest themselves to those skilled in the art and such adjustments are within the scope of our invention. We, therefore, do not intend to limit ourselves otherwise than as set forth in the claims which follow.

Having now fully described our invention, what we claim as new and desire to secure by Letters Patent is:

1. In a free standing blast fence for use in the open in deflecting the blast from a jet engine, which fence comprises a metallic frame structure composed of frame members having a plurality of spaced, parallel, curved metallic vanes extending therebetween, said fence being disposed at an angle to the horizontal, with the vanes sloping in the opposite direction to the framework; the improvement wherein the sloping frame members are constituted of two channel sections disposed with their flanges in interdigitated relation and bolted together.

2. In a free standing blast fence for use in the open in deflecting the blast from a jet engine, which fence comprises a metallic frame structure composed of frame members having a plurality of spaced, parallel, curved metallic vanes extending therebetween, said fence being disposed at an angle to the horizontal, with the vanes sloping in the opposite direction to the framework; the improvement wherein said fence is composed of a plurality of units, each comprising two channel members in spaced back to back relation, and a plurality of metallic vanes extending therebetween and secured thereto.

3. A structure according to claim 2 wherein each end of each of said vanes is secured to a plate, and wherein said plates are adjustably secured to said channels.

4. A structure according to claim 2 wherein each end of each of said vanes is secured to a plate, said plate having a bolt hole, and wherein each said plate is pivotally secured to a channel by a bolt passing through said hole, each said plate having a part-circular slot about said bolt hole as a center and an additional bolt passing through said slot and through said channel for securing said plate in a desired position of angular adjustment.

5. A structure according to claim 4 wherein the bolt holes in said channels are square, wherein said bolts are carriage bolts and wherein the nuts are threaded onto the vane side of said channels.

6. A structure according to claim 1 wherein strut members are provided for supporting said frame structure in sloping position, said strut members being constituted of two channel sections disposed with their flanges in interdigitated relation and bolted together.

7. A structure according to claim 6 wherein anchor plates are provided for said frame members and for said struts, said frame members and struts being pivotally secured to said anchor plates, said struts being securable to said frame members in a number of positions and said anchor plates being anchored to the ground whereby the angle of said fence with respect to the ground may be varied.

8. A structure according to claim 7 wherein channel members are secured to said frame members, said channel members having a plurality of bolt holes in the flanges thereof, said struts being bolted to said channels by bolts passing selectively through pairs of said bolt holes.

9. A structure according to claim 8 wherein each end of each of said vanes is secured to a plate, said plate having a bolt hole, and wherein each said plate is pivotally secured to a channel by a bolt passing through said hole, each said plate having a part-circular slot about said bolt hole as a center, and an additional bolt passing through said slot and through said channel for securing said plate in a desired position of angular adjustment.

10. A structure according to claim 9 wherein the bolt holes in said channels are square, wherein said bolts are carriage bolts and wherein the nuts are threaded on the vane side of said channels.

11. A structure according to claim 2, wherein said vanes are fixedly secured to said channel members.

12. A structure according to claim 2, wherein said vanes are hollow and of relatively flat cross section, having a concave top surface, and having a continuous surface over the top, trailing edge, bottom, and leading edge.

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