Feb. 21, 1956 W. C. WALKER 2,735,261

BLAST DIRECTOR FOR FLUID STREAMS

Filed Sept. 8, 1950

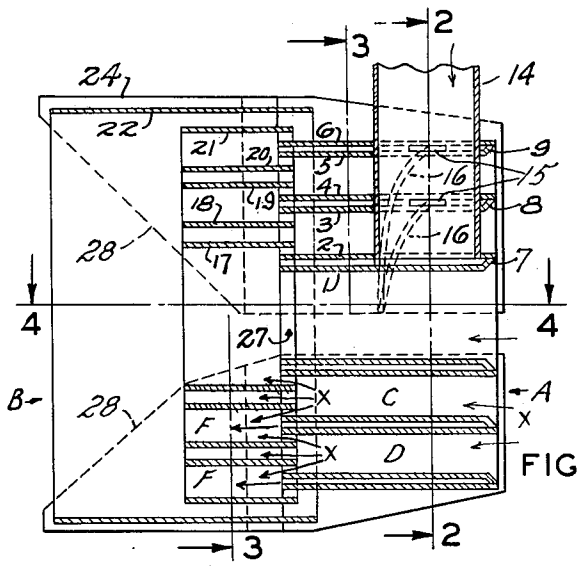


FIG. 1

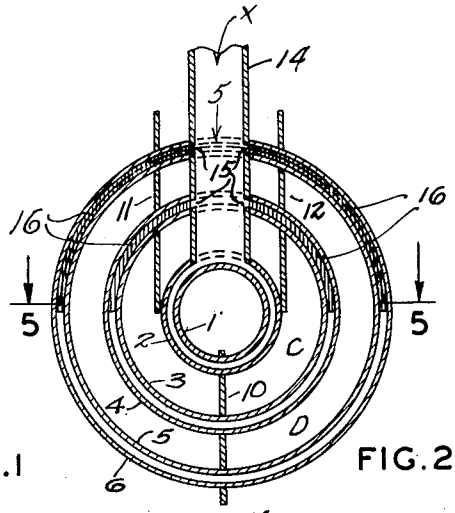


FIG. 2

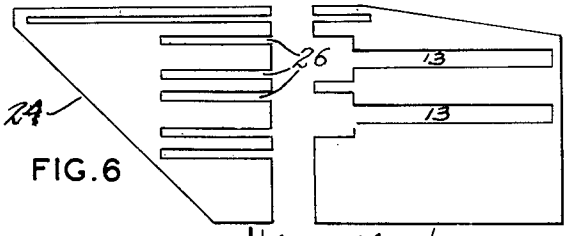


FIG. 6

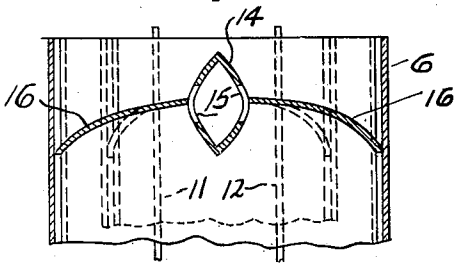


FIG. 5

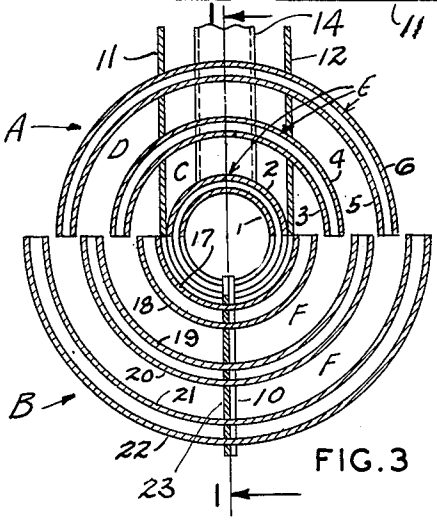


FIG. 3

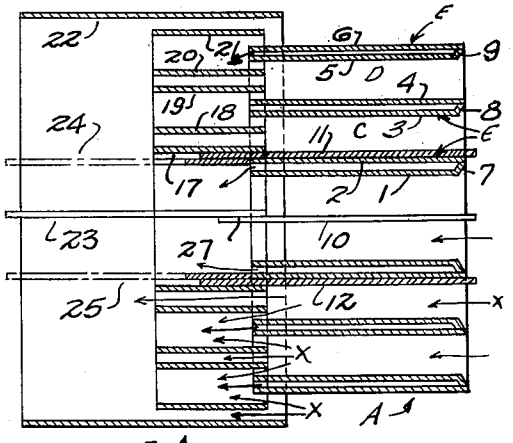


FIG. 4

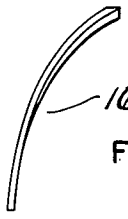


FIG. 7

INVENTOR.
William C. Walker
BY Rodney Bedell
Atty.

United States Patent Office

2,735,261

Patented Feb. 21, 1956



2,735,261

# BLAST DIRECTOR FOR FLUID STREAMS

William C. Walker, Granite City, Ill.

Application September 8, 1950, Serial No. 183,756

4 Claims. (Cl. 60—35.5)

The invention relates to the use of fluid under relatively high pressure to entrain a greater quantity of fluid under relatively low pressure to react against a mass of the latter-mentioned fluid to effect propulsion of a vehicle through the mass.

The main object of the invention is to utilize a blast director to obtain a relatively large and effective discharge of a stream of mixed motive and entrained fluid, such as steam and water, or gas and air. Another object is to effectively deliver a stream of the motive fluid to the director transversely of the direction of flow of the entrained fluid and, at the same time, effect substantially equal distribution of the entrained fluid about the axis of the director and without undesirable interference by the conduit for the motor fluid.

The invention includes a series of concentric cylinders, one within the other, alternate spaces between the cylinders forming motive fluid discharge chambers and the other spaces forming through passages for the entrained fluid, there being a conduit for the motive fluid extending through the cylinders transversely of their axis with outlets to the motive fluid passages.

Preferably the invention comprises two units of cylinders, as described above, arranged substantially end to end but with their cylinders of one unit being offset radially of the cylinders of the other unit.

It is another object to construct and assemble such units simply and effectively into a single complete structure which may be applied to a vehicle for propulsion purposes.

These and other detailed objects of the invention are attained by the structure illustrated in the accompanying drawings, in which:

Figure 1 is a vertical, longitudinal, central section through a blast director.

Figures 2 and 3 are vertical transverse sections taken on the lines 2—2 and 3—3 respectively, of Figure 1.

Figure 4 is a horizontal section taken on the line 4—4 of Figure 1.

Figure 5 is a detailed horizontal section taken approximately on an arcuate line 5—5—5 of Figure 2 to show elements of Figure 7 in section throughout their length.

Figure 6 is a detailed elevation of the positioning plates for the cylinders shown before assembly with each other.

Figure 7 is a detail of one of the baffle plates used in the motive fluid chambers.

The device embodies a primary director unit A which receives the motive fluid and entrains what may be considered a series of streams of the surrounding fluid and discharges them into a secondary unit B which serves as a director for an additional quantity of entrained fluid. Unit A could be used independently of unit B but their assembly is the preferred arrangement.

Unit A (Figures 1–5) consists of a series of concentric cylinders 1, 2, 3, 4, 5, 6, each succeeding cylinder being of increased diameter and enclosing the next smaller cylinder. Cylinder 1 is open from end to end of the unit; a closure 7 extends between the right-hand ends of cylinders



1 and 2. The space C between cylinders 2 and 3 is open from end to end of the unit. A closure 8 extends between the right-hand ends of cylinders 3 and 4, being inclined to facilitate the flow of the surrounding fluid into the open cylinders. This inclination is shown more abrupt than in actual use because of the reduced scale of the drawings, but it will be understood the inclination of the ends will be adapted for the intended purpose. The space D between cylinders 4 and 5 is open from end to end of the unit. A closure 9 extends between the right-hand ends of cylinders 5 and 6.

Positioning plates 10, 11, 12 are slotted as indicated at 13, Figure 6, to receive pairs of adjacent cylinders 1 and 2, 3 and 4, and 5 and 6, and will be secured to the cylinders by welding or otherwise to hold them in spaced relation.

The spaces E between the cylinders connected by closures 7, 8 and 9 may be called motive fluid discharge passages and preferably their cross section areas are substantially smaller than the areas of the through spaces C, D, E within cylinder 1 and between cylinders 2 and 3 and cylinders 4 and 5.

An impulse fluid conduit 14 extends transversely through the unit, preferably near the unit end adjacent to closures 7, 8, and 9 and is provided with lateral discharge openings 15 leading into the motive fluid passages E. Quadrant-like baffles 16 extend from the mid-point of each opening 15 forwardly and downwardly to insure the distribution of approximately half of the motive fluid passing through that opening to the lower portion of the discharged passage.

Preferably conduit 14 is flattened transversely of the unit to present sharply inclined surfaces to the streams of entrained fluid, facilitating its passage through the unit with minimum turbulence.

Unit B comprises a series of cylinders 17, 18, 19, 20, 21, 22, arranged similarly to the arrangement of cylinders in unit A but of different diameters. Inner cylinder 17 is of larger diameter than cylinder 2 of unit A; cylinder 18 is of smaller diameter than cylinder 3 of unit A; cylinder 19 is of larger diameter than cylinder 4 of unit A; cylinder 20 is of smaller diameter than cylinder 5 of unit A; cylinder 21 is of larger diameter than cylinder 6 of unit A; and cylinder 22 is of still larger diameter and substantially longer, forming a discharge shell for the combined motive and entrained fluids. The arrows X indicate the flow of fluids.

The cylinders of unit B are positioned relative to each other by plates 23, 24, 25 corresponding generally to plates 10, 11, 12, having deep slots 26 to receive individually spaced cylinders of unit B. The plates are not slotted for the ends of the cylinders in unit A, but terminate at the ends of those cylinders. Plates 10, 11, 12, and 23, 24, and 25 are overlapped at 27 and welded together to form a rigid unit. Plates 23, 24, and 25 have their left-hand edges inclined from the axis of the unit to its outer periphery.

With this construction, steam, or other motive fluid, is admitted through conduit 14 and passes through outlets 15 into the restricted discharge passages E between the cylinders of unit A and the discharge of this motive fluid through annular outlets at the left-hand end of unit A entrains a quantity of fluid through the other annular passages C, D between the unit cylinders. As the motive fluid is discharged from unit A, it expands into the outer annular passages therefor in unit B adding further impetus to the entrained fluid, the flow of which is maintained in a direction parallel to the length of the units with a minimum of turbulence due the cylinders of unit B. The extension of the discharge shell 22 directs the combined annular streams of motive and entrained fluid into the surrounding fluid to effect a forceful reaction tending

to impel the vehicle on which the director is mounted.

The details of the structure may be varied without departing from the spirit of the invention and the exclusive use of those modifications of the structure coming within the scope of the accompanying claims is contemplated.

What is claimed is:

1. A director for a fluid blast from a discharge tube, comprising two units, each consisting of a series of concentric substantially straight-sided annular chambers of progressively larger diameters, said units being arranged substantially end to end with the walls of the chambers of one unit disaligned with the walls of the chambers of the other unit, and a conduit for conveying a blast to all of the chambers of one unit near the end of the latter remote from the other unit and directing the discharge from said conduit towards the other unit.

2. In a fluid blast director, a primary unit structure and a secondary unit structure, each comprising a series of concentric cylinders, one within the other, and spaced apart to form annular chambers between successive cylinders extending the full length of the respective structure, the two unit structures being spaced substantially end to end and the cylinders of one structure being offset radially from the cylinders of the other structure, closures for alternate chambers at the outer end of each cylinder of the primary structure, and a conduit extending transversely of the cylinders of said primary structure with outlets into the chambers provided with said closures.

3. A fluid blast director as described in claim 1 which includes plates extending lengthwise of each unit and holding the chamber walls in spaced relation, the adjacent ends of the plates of the two units being connected to each other.



4. In a blast director, a structure comprising a series of concentric cylinders, one within the other, and spaced apart to form annular chambers between successive cylinders, extending substantially the full length of the cylinders, a closure at one end of said structure for the chamber between each cylinder and one adjacent cylinder, the alternate chambers forming through passages from end to end of the structure, a motive fluid conduit extending laterally through the cylinders with openings into the chambers provided with a closure, and baffle elements extending through the upper half of the chambers provided with a closure, said baffle elements being positioned between the openings in the motive fluid conduit and the open ends of said chambers.

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