

Dec. 4, 1956

E. A. STALKER
FLUID TURNING BLADES
Filed Aug. 3, 1950

2,772,855

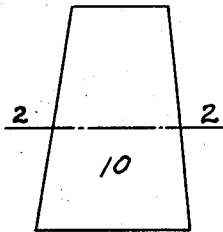


Fig. 1

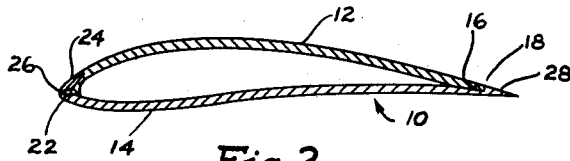


Fig. 2

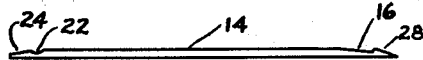


Fig. 3

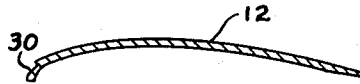


Fig. 4

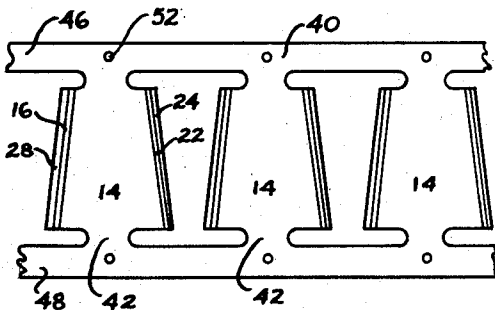


Fig. 5

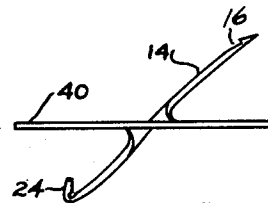


Fig. 6

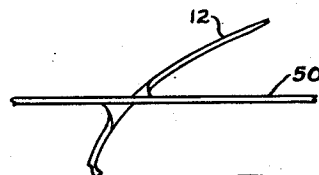


Fig. 7

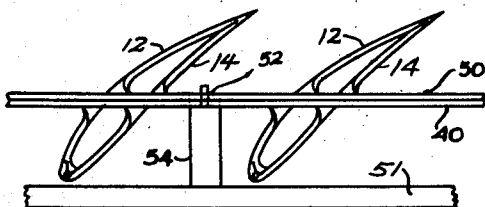


Fig. 8

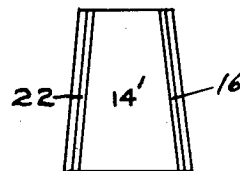


Fig. 9

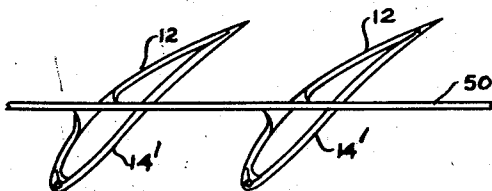


Fig. 10

INVENTOR.
Edward A. Stalker

1

2,772,855

FLUID TURNING BLADES

Edward A. Stalker, Bay City, Mich., assignor to The Stalker Development Company, Bay City, Mich., a corporation of Michigan

Application August 3, 1950, Serial No. 177,479

5 Claims. (Cl. 253-77)

This invention relates to blades for compressors and turbines and other machines in which an interchange of energy with a fluid occurs.

An object of the present invention is to provide a blade which is economical to produce.

Another object is to provide a means of fabricating blades.

Still another object is to provide a blade formed from sheet metal which requires a minimum of finishing at its joints.

Other objects will appear from the description, drawings and claims.

I accomplish the above objects by the means illustrated in the accompanying drawings in which—

Fig. 1 is a plan view of a blade according to the present invention;

Fig. 2 is a section along line 2-2 in Fig. 1;

Fig. 3 is a view in side elevation of a blade lower part before being given the airfoil contour;

Fig. 4 is a section of the blade upper part;

Fig. 5 shows in plan a gang of blade lower parts partly pressed to shape;

Fig. 6 is a side elevation of a portion of the gang of Fig. 5;

Fig. 7 is a side elevation of a portion of the gang of blade upper parts;

Fig. 8 shows the upper gang superimposed on the lower gang 30 and supported on a fixture;

Fig. 9 is a plan view of an individual blade lower part of a modified form; and

Fig. 10 shows a gang of blade upper parts and individual blade lower parts placed in mating relation thereon.

As shown particularly in Fig. 2 the blade 10 is formed in two parts, the upper part 12 and the lower part 14. The latter has the groove or recess 16 near the trailing edge into which the upper part nests. The groove is just deep enough that the upper surface of the blade is fair across the joint 18.

At the leading edge of lower part 14 there is the groove or recess 22 forming a portion of reduced thickness so that the narrow outer part 24 beyond the groove can be bent about the recess into the position shown with a very small nose radius 26.

The lower part with the grooves is shown in Fig. 3 before the part is bent to the shape shown in Fig. 2.

The grooves 16 and 22 and the tapered parts 24 and 28 are preferably stamped or rolled to shape.

The upper part 12 has the groove 30 forming a contoured edge as shown in Figs. 2 and 4 into which the portion 24 fits.

It will be observed that both parts can be rolled or pressed or milled and that when the two parts are assembled there are no further operations required to form the leading and trailing edges. This is a very important point since machining operations to produce faired surfaces at the leading and trailing edges are very expensive.

While either part may be regarded as a base part which

2

carries the other or mating part, for succinctness in the claims I refer to the part 14 as a base part or wall and to the juxtaposed blade parts 12 as complementary parts. The front portion of either wall especially the portions which are curved are called nose portions.

The blade parts 14 are preferably stamped in a carrier strip of metal 40 and held integral therewith as shown in Fig. 5 by the small necks of metal 42 thus constituting a gang or set of blade parts. The strip may be of any length and contain any number of blades.

In the next operation as shown in Fig. 6 the leading edge portion 24 is bent to the position shown in Fig. 2 and the general curvature is impressed on the part as shown in the latter figure. The blade part is twisted at the neck 42 to an angle of about 45° relative to the plane of the strip at its edges 46 and 48.

The upper parts 12 are formed in a strip 50 in a manner similar to that of the lower parts 14. Suitable lengths of the two strips are imposed one on the other as shown in Fig. 8 and located by the pins 54 (of fixture 51) passing through the holes 52 in the strips 40 and 50. The complementary parts to form a blade are thus brought into registration or mating relation. The juxtaposed strips 40 and 50 held in place by the pins 54 on the fixture 51 are passed through a brazing furnace to braze the joints at the leading and trailing edges of each blade assembly. The brazing material may be inserted or painted on the parts at the joints just before the blade parts are brought into mating relation.

After removal from the furnace the blade necks may be sawed through to free the blades from the strips.

The blades are particularly adapted for stator blades in axial flow compressors and turbines where they may be inserted in suitable rings at either or both ends.

Instead of both upper and lower blade parts being carried in strips, just one strip of blade parts may be used and the mating parts may be individually made and placed in mating relation on the strip. Such an individual mating part is shown in Fig. 9 as 14'. Fig. 10 shows such mating part placed on parts 12.

I refer to the end portions 24 and 28 as being outside or outwardly of the grooves 22 and 16 respectively.

Although the carriers are shown in the figures as being straight, they may also be arcuate or any other shape.

While I have illustrated a specific form of this invention it is to be understood that I do not intend to limit myself to this exact form but intend to claim my invention broadly as indicated by the appended claims.

I claim:

1. A hollow sheet metal fluid turning blade having leading and trailing edges and a predetermined airfoil contour as assembled comprising a base wall of sheet metal shaped to form the lower face of said blade and having spanwise recesses inwardly of and adjacent both leading and trailing edges thereof forming portions of reduced thickness substantially at the leading and trailing edges less than that of the adjacent portions of said base wall, said reduced thickness portion adjacent the leading edge being folded upon itself, forming a short radius bend the outer surface of which defines the nose of the blade, and a complementary blade wall of sheet metal supported in mating relation on said base wall, said complementary wall being shaped to form the upper face of said blade and having a contoured edge fitting within and fairing with said tapered marginal edge of said base wall, said walls being bonded together at the contiguous interfitted portions thereof.

2. A hollow sheet metal fluid turning blade having leading and trailing edges and a predetermined airfoil contour as assembled comprising a base wall of sheet metal shaped to form the lower face of said blade and having spanwise recesses inwardly of and adjacent both

3

leading and trailing edges thereof forming portions of reduced thickness substantially at the leading and trailing edges less than that of the adjacent portions of said base wall, said reduced thickness portion adjacent the leading edge being folded upon itself, forming a short radius bend defining the nose of the blade, the rearward portion of said base wall outwardly of said trailing edge recess also having a tapered marginal edge, and a complementary blade wall of sheet metal supported in mating relation on said base wall, said complementary wall being shaped to form the upper face of said blade and having a contoured edge interfitting and fairing with said tapered marginal edge of said forward wall portion, the opposite edge of said complementary blade wall interfitting and fairing with said trailing edge recess and said tapered edge to form the trailing edge of the blade, said walls being bonded together at the contiguous interfitting portions thereof.

3. A hollow sheet metal fluid turning blade having leading and trailing edges and a predetermined airfoil contour as assembled comprising a base wall of sheet metal shaped to form the lower face of said blade and having spanwise recesses inwardly of and adjacent both leading and trailing edges thereof forming portions of reduced thickness substantially at the leading and trailing edges less than that of the adjacent portions of said base wall, said reduced thickness portion adjacent the leading edge being folded upon itself, forming a short radius bend defining the nose of the blade, the rearward portion of said base wall outwardly of said trailing edge recess also having a tapered marginal edge, and a complementary blade wall of sheet metal supported on said base wall, said complementary wall being shaped to form the upper face of said blade and having contoured edges fitting within and fairing with both said tapered marginal edges of said base wall, said walls being bonded together at the contiguous interfitting portions thereof.

4. A hollow sheet metal fluid turning blade having a nose and a trailing edge and having a predetermined airfoil contour on both its upper and lower faces as assembled comprising a base wall of sheet metal shaped to form one face of said blade and having a spanwise recess located inwardly of one edge thereof leaving a narrow outer portion separated by a portion of reduced thickness substantially at the leading edge less than that of the adjacent portions of said base wall, said portion of reduced thickness being folded upon itself forming a

4

short radius bend the outer surface of which defines said nose of the blade and having said narrow outer portion projecting upwardly and toward the trailing edge of the blade, and a complementary blade wall of sheet metal supported in mating relation on said base wall, said complementary wall being shaped to form the opposite face of said blade and having a contoured edge fitting within and fairing with said narrow outer edge portion of said base wall, said walls being bonded together at the contiguous interfitting portions thereof.

5. A hollow sheet metal fluid turning blade having leading and trailing edges, and having a predetermined airfoil contour as assembled comprising a base wall of sheet metal shaped to form one face of said blade and having a spanwise recess inwardly of and adjacent both leading and trailing edges thereof forming portions of reduced thickness less than that of the adjacent portions of said base wall and leaving a narrow portion of said base wall outwardly of said leading edge recess, said leading edge recess being located substantially at the leading edge, said leading edge reduced thickness portion being folded upon itself forming a short radius bend the outer surface of which defines the nose of the blade and having a narrow marginal edge extending upwardly and toward the trailing edge of the blade, and a complementary blade wall of sheet metal supported in mating relation on said base wall, said complementary wall being shaped to form the opposite face of said blade and having a contoured edge fairing with said narrow marginal edge of said base wall, said walls having cooperating interfitting portions at their opposite edges forming the trailing edge of the blade, and said walls being bonded together at the contiguous interfitting portions thereof.

References Cited in the file of this patent

UNITED STATES PATENTS

863,428	Nikonow	Aug. 13, 1907
994,166	Kienast	June 6, 1911
1,762,352	Ray	June 10, 1930
1,838,674	Heath	Dec. 29, 1931
1,939,357	Lorenzen	Dec. 12, 1933
2,431,064	McKee	Nov. 18, 1947
2,440,127	Stulen	Apr. 20, 1948

FOREIGN PATENTS

760,328	France	Dec. 6, 1933
---------	--------	--------------