March 14, 1961 E. A. MADER 2,974,731

COMBINED IMPELLER AND CLOSURE

Filed June 2, 1958 2 Sheets-Sheet 1

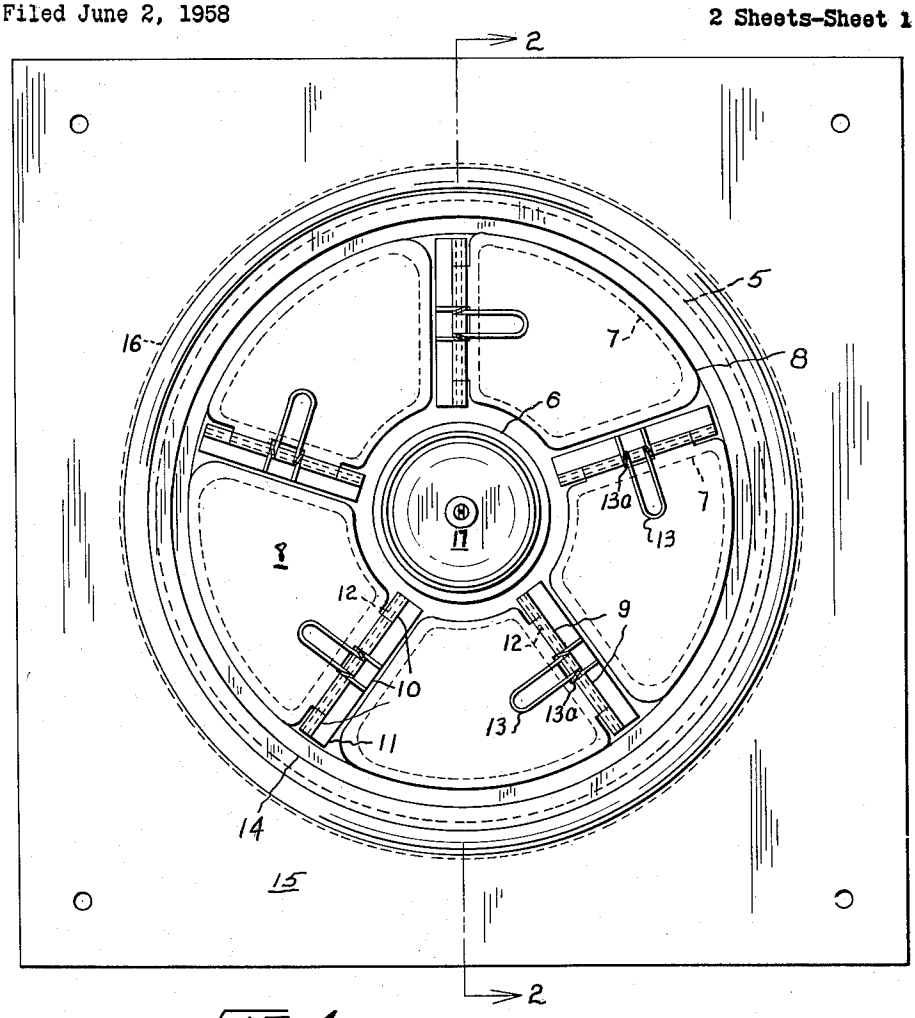


FIG. 1

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FIG. 2

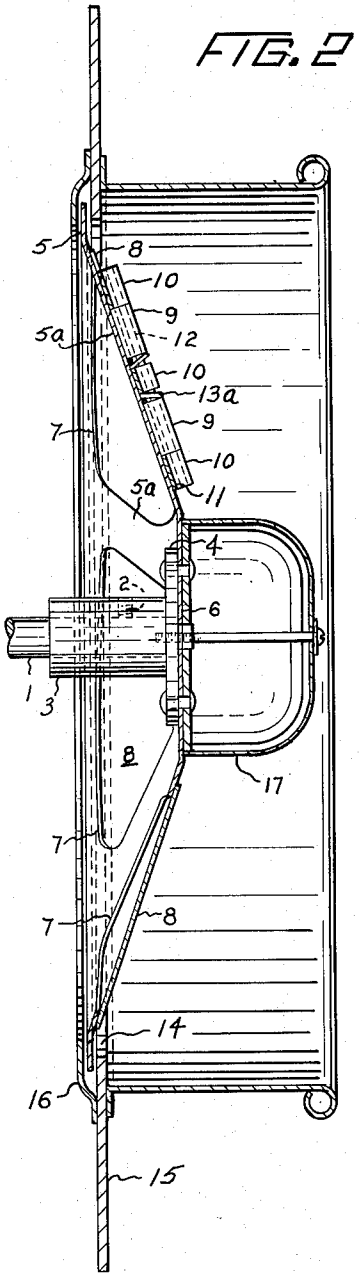
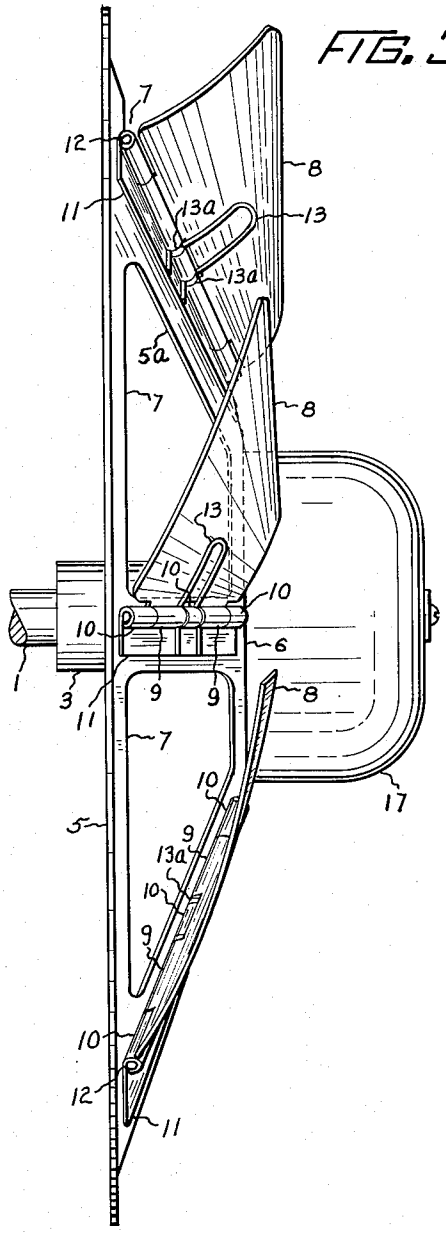


FIG. 3



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COMBINED IMPELLER AND CLOSURE

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1 Claim. (Cl. 170—160.51)

This invention is an improvement over the subject matter of my Patent 2,383,001, issued August 21, 1945, and relating to impellers having blades pivotally mounted to exercise a closure function when the impeller is idle, and to respond to impeller rotation by assuming an impelling position. In the prior invention, a disc **13** is coaxially associated with a sleeve **3** of an impeller hub **4**, and coiled tension springs **12** extended between the disc and blades to urge the latter to a closure-forming position.

An object of the present improvement is to provide a simpler, less expensive, and longer-lived spring means to urge the impeller blades to their closure forming position.

This and various other objects are attained by the construction hereinafter described, and illustrated in the accompanying drawings, wherein:

Fig. **1** is an elevational view of the impeller and its mounting, showing the fluid-exhausting end thereof.

Fig. **2** is a vertical cross-section on a larger scale on the line **2—2** of Fig. 1.

Fig. **3** is a side elevational view of the impeller on a still larger scale, showing the blades in impelling position.

In these views (as in earlier Patent 2,383,001), the reference character **1** designates a shaft rotatively driven by an electric or other motor (not shown). Fixed on such shaft by a set screw **2** or the like is a sleeve **3** rigidly carrying an impeller hub **4**. Riveted or otherwise rigidly mounted on such hub is a sheet metal blade carrier **5** forming the frustum of a cone, coaxial with the shaft. Said carrier at its smaller end forms a disc **6** transverse to the shaft and engaging the hub **4**. The conical face of the carrier is formed with a plurality of circumferentially spaced openings **7**, substantially sector-shaped, and a set of sheet metal blades **8** are pivoted on the carrier upon radially elongated portions **5***a* thereof between said openings, to alternatively occupy a closure position for said openings or a fluid-impelling position of divergency to said conical face. Said blades conform substantially to the conical curvature of the carrier and in their closure positions slightly overlap the margins of the openings **7**, substantially sealing the latter.

The construction disclosed by the aforesaid patent differs from that herein disclosed in that a marginal portion of each blade of the latter is formed with a pair of spaced tongues uniformly rolled back upon the blade to form aligned tubular sections **9** of a hinge barrel. Such sections have an aligned, interfitting relation with other tubular sections **10**, to complete such hinge barrel, the pivotal axis of which is centered on the rotational axis of the impeller. The sections **10** of said hinge barrel are formed on a strip of metal **11**, rigidly fixed to said radially elongated portions **5***a* of the carrier **5**. Hinge pins **12** are received in said barrels and pivotally maintain the blades in position.

Substantially U-shaped springs **13** have elongated arms formed with coils **13***a* through which said hinge pins

pass. As best seen in Figs. 1 and 3, each spring has its yoke portion and its two free end portions reacting respectively between a respective blade **8** and a strip **11** to urge the former to its closure forming position.

The described impeller is disposed within and coaxial with a circular opening **14** in a sheet metal plate **15**, which may be installed in a wall or within a duct or in some other suitable location. Preferably the carrier **5** peripherally overlaps the margin of said opening, and is itself overlapped by an annular ring **16** secured to the plate **15**. This arrangement serves as a baffle to avert the material flow of fluid past the periphery of the impeller.

When the impeller is driven, its blades swing out, the resultant pitch being determined by the resistance of the springs to centrifugal force created by impeller velocity.

The cap **17**, mounted centrally on the hub **4**, protects the fastenings by which the carrier is mounted on the hub and further serves to reduce materially the tendency toward back flow along the axis of the impeller.

It will be seen that the improved construction, employing the spring mounted on the hinge pin **12**, eliminates the need of the disc **13** of the prior construction aforesaid, and further eliminates necessity of providing each blade with an eyelet to engage the end of a coil spring **12**. The elements **10** and **11**, comprising the fixed portion of the hinge in the present construction do not require special manufacture, and thus the device herein described affords less complicated and more inexpensive construction.

What I claim is:

An impeller comprising an approximately conical rotary carrier formed of sheet material and having a plurality of circumferentially spaced fluid flow openings and formed with substantially imperforate portions between such openings, a plurality of blades forming closures for the openings, hinge pins pivoting the blades on said imperforate portions on axes intersecting the axis of carrier rotation and conforming to the conical inclination of the carrier, whereby the blades tend to centrifugally swing about the hinge pins responsive to carrier rotation to establish a fluid-impelling position of the blades, a spring installed on each pin and forming a pair of coils spaced apart longitudinally of such pin and forming between such coils a U-shaped arm urging the corresponding blade to its closure position, and forming a pair of arms spaced apart by the coils and applying thrust to an adjoined one of said imperforate portions, and hinge barrels respectively receiving the respective pins, each such barrel comprising sections fixed on the corresponding blade and sections fixed on said imperforate portions, one of the last mentioned sections of each barrel being interposed between said coils of the corresponding spring.

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