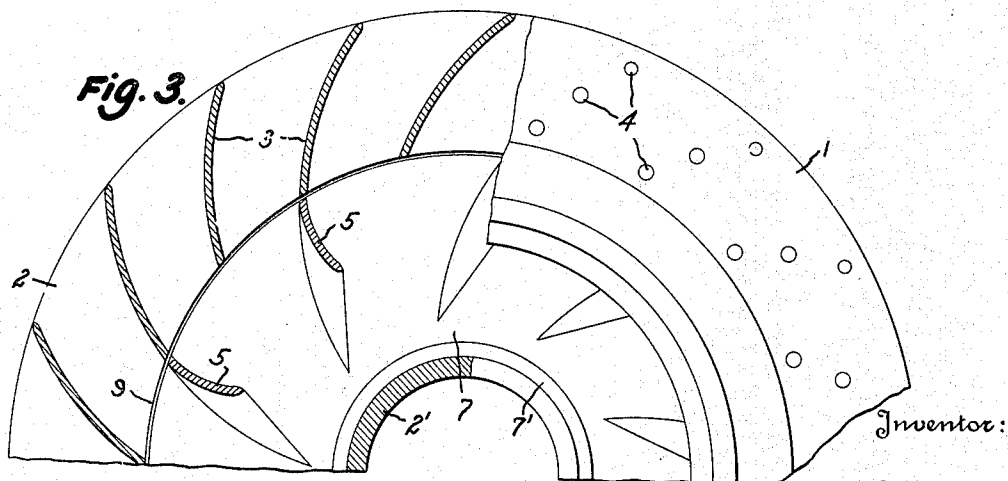
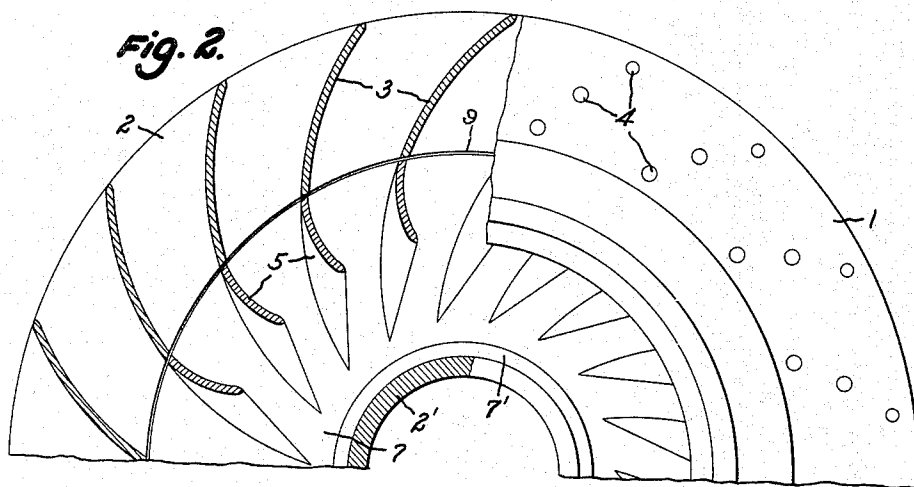
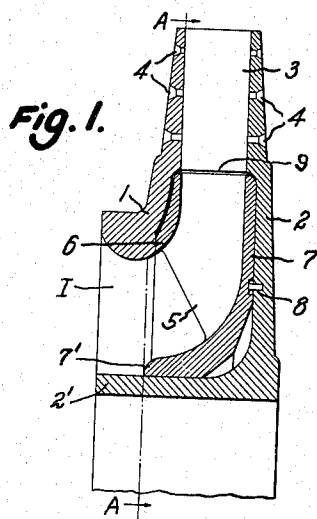


May 28, 1946.

W. VAN RIJSWIJK
CENTRIFUGAL COMPRESSOR

2,401,206

Filed Sept. 14, 1943



Inventor:

Willm Van Rijswijk,
Pierce & Scheffler,
Attorneys.

334

UNITED STATES PATENT OFFICE

2,401,206

CENTRIFUGAL COMPRESSOR

Willem van Rijswijk, Baden, Switzerland, assign-
or to Aktiengesellschaft Brown, Boveri & Cie,
Baden, Switzerland

Application September 14, 1943, Serial No. 502,333
In Switzerland August 8, 1942

8 Claims. (Cl. 230-134)

Sometimes it is desired that the impellers of centrifugal compressors should have skewed blades. This, however, meets with certain difficulties, especially with impellers having high peripheral velocities where for reason of safety cast wheels cannot be used, because the usual method of fixing the blades by means of rivets milled out of the blades can no longer be employed in this case.

It has already been attempted to avoid skewing the blades by arranging an additional impeller with axial blading in front of the main impeller or by inserting such an additional wheel with partial axial blading which becomes radial towards the outlet into the inlet opening of the main impeller. Both methods have, however, the disadvantage that the blades of the additional impeller obstruct the inlet opening of the main impeller too much.

The present invention concerns an impeller for a centrifugal compressor whose blading is skewed at the inlet, but afterwards is axially cylindrical. The novel feature of the invention is that the impeller consists of a main impeller comprising a hub disc and a cover disc and an additional impeller with skewed blades which is located inside the main impeller and has a diameter larger than that of the inlet opening of the main impeller. One method of making this combined impeller is to locate and fix the additional impeller inside the main impeller before this latter is finally assembled so that the additional impeller is accurately centred, whereupon the hub disc and cover disc of the main impeller are connected together by way of the blades of the main impeller and the inserted additional impeller.

Constructional examples of impellers embodying the invention are shown in the accompanying drawing in which:

Fig. 1 is an axial section through the upper half of an impeller; and

Figs. 2 and 3 are fragmentary end elevations, with parts in section as taken approximately on line A—A of Fig. 1, of impellers having different relations between the blades of the impeller sections.

In the drawing, the reference numeral 1 indicates the cover disc having a central opening, 2 the hub disc and 3 the blades which are connected to the discs 1 and 2 by means of rivets 4. These blades are axial-cylindrical and generally curved and they form the usual annular assembly of impeller blading. The additional or part impeller 5 which is built into the space radially inward of the blade assembly of the main wheel

before the blades are riveted; this impeller 5 may for instance be of the cast type with a centrally-apertured forward shroud seating against the inside of the cover plate 1 whilst the rear shroud 7 is in contact with the hub disc 2, the impeller being centred on this latter disc. The hub disc 2 has the usual cylindrical hub 2' for mounting the impeller on a shaft, not shown, and the inner portion 7' of the rear shroud 7 of the skew impeller 5 is curved towards the inlet and has an outer surface seating upon the hub 2'. The annular space between the inner edge of the cover disc 1 and the hub 2' is the axially extending inlet passage 1, and the inner edges of the shrouds 6, 7 are rounded off to form a smooth extension of the inlet passage. The impeller 5 is preferably centered on the hub 2' of the main impeller before the cover plate 1 is brought into position, and is keyed to the main impeller by pins or rivets 8. Under certain conditions, it is sufficient if the additional impeller is clamped between the hub disc 1 and cover disc 2 in such a manner that relative displacement is impossible.

The blades of the wheel 5 are manufactured with the desired skewed form and their outlet edge either coincides exactly with the inlet edge of the blades 3 or at least part of the former are displaced more or less with regard to these latter blades. The main impeller can have the same or a different number of blades as the additional impeller. In the latter case it is expedient to give the main impeller more blades than the additional impeller. The radial gap 9 between the impeller 5 and the blades 3 can be made as narrow or as wide as desirable.

If the combined impeller is constructed, as shown in Fig. 2, in such a manner that the outer ends of the blades 5 of the additional impeller exactly coincide with the inlet edges of the external blades 3 of the riveted main impeller, then uninterrupted impeller channels are formed which are bounded at the entrance by skewed blades and at the outer part by axial-cylindrical blades. This design is often preferred to the one where the additional impeller has fewer blades, see Fig. 3, than the main impeller or where there is a gap between both kinds of blades, because a very good conductance of the medium which is to be compressed is obtained.

I claim:

1. An impeller for a centrifugal compressor, said impeller comprising a hub disk, a cover disk, a plurality of main impeller blades in an annular assembly between said disks, said disks and blades having cooperating means for securing said

blades to said disks, and an additional impeller located within said annular assembly of impeller blades and secured between said disks, said additional impeller and hub disk having cooperating parts for centering said additional impeller with respect to said blades.

2. A centrifugal compressor impeller having skewed blading, said impeller comprising the combination with a hub disk, a cover disk having a central opening, and axially cylindrical blades secured between said disks to form a main impeller having an axially arranged inlet passage; of an additional impeller with skewed blades located inside of and secured to said main impeller, the additional impeller having a diameter larger than that of said inlet.

3. A centrifugal compressor impeller as recited in claim 2, wherein the blades of the additional impeller at least partly connect up with the blades of the main impeller.

4. A centrifugal compressor impeller as recited in claim 2, wherein the main impeller and the additional impeller have the same number of blades.

5. A centrifugal compressor impeller as recited in claim 2, wherein the main impeller has more blades than the additional impeller.

6. A centrifugal compressor impeller as recited in claim 2, wherein there is a gap between the main impeller and the additional impeller.

7. A centrifugal compressor impeller as recited in claim 2, wherein the additional impeller is of the cast type.

8. A centrifugal compressor impeller as recited in claim 2, wherein the main impeller and the additional impeller have the same number of blades, and the outer edges of the blades of the additional impeller aline with the inlet edges of the blades of the main impeller.

WILLEM VAN RIJSWIJK.