Oct. 12, 1926. 1,603,076

C. H. HANSON

MEANS AND METHOD FOR DYNAMICALLY BALANCING INCASED FAN BLADES

Filed Nov. 27, 1922

Fig.-1

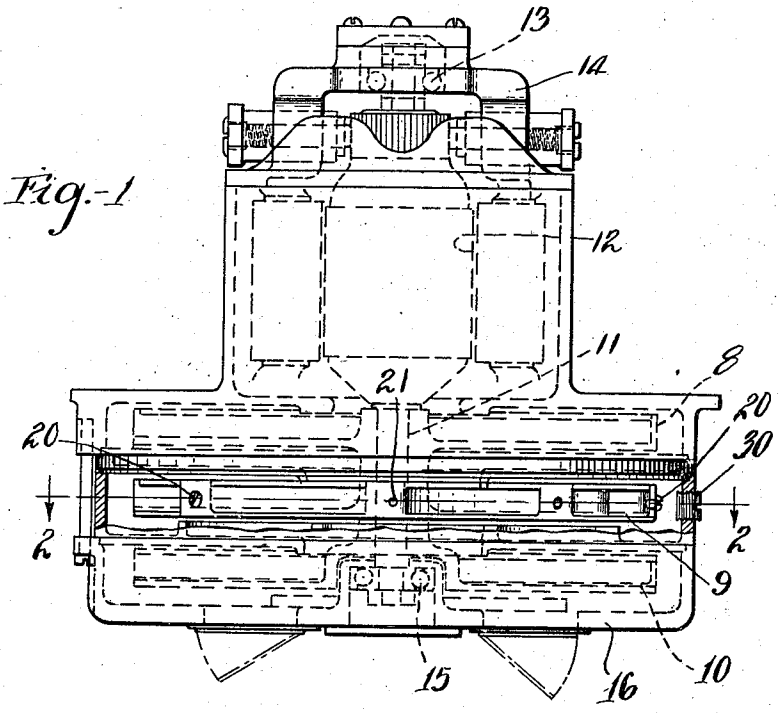
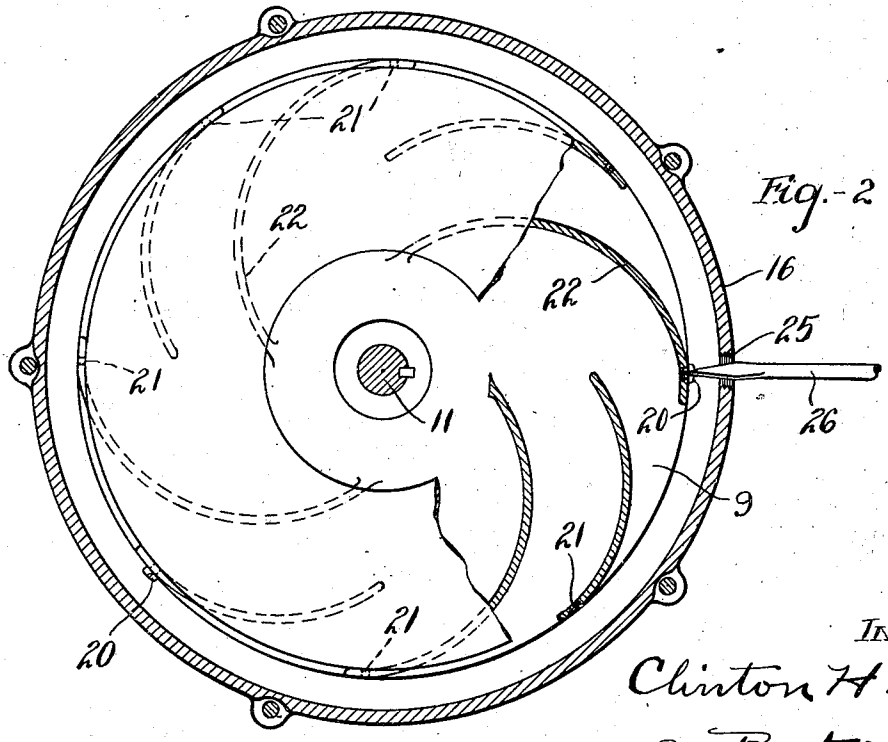


Fig.-2



INVENTOR

Clinton H Hanson

BY Bates & Mackin,

ATTYS.

Patented Oct. 12, 1926. 1,603,076

UNITED STATES PATENT OFFICE.

CLINTON H. HANSON, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE MOTOR PLAYER CORPORATION, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

MEANS AND METHOD FOR DYNAMICALLY BALANCING INCASED FAN BLADES.

Application filed November 27, 1922. Serial No. 603,618.

This invention relates to the means and method of dynamically balancing rotary elements, particularly elements which are mounted within an inclosed casing.

As an example of apparatus to which my invention is particularly applicable, I refer to the suction device shown in Patent No. 1,320,224, issued to George W. Garman, October 28, 1919. Briefly, this apparatus comprises a set of fan blades mounted on an armature shaft of an electric motor, together with suitable baffles for directing the flow of air in such manner as to reduce the noises to a minimum. To maintain sufficient vacuum for operating the pneumatics of a player piano, it has been found necessary to operate the motor at a very high rate of speed and it has also been found that much of the objectionable noises resulting from vibration, is caused by inaccurate balancing of the rotary fan blades. The use of an inclosed casing around the fan blades as a bearing for the shaft, and also as a baffle for the air flowing through the apparatus presents considerable difficulty in maintaining accurate balancing after the unit is assembled.

Accordingly, one of the objects of my invention is the provision of means for reducing the time usually required for dynamically balancing the rotary elements in such a suction producing unit, whereby certain inaccuracies which may have developed after the unit is housed in the inclosed casing may be readily corrected, without dismantling the apparatus.

I carry out the above object by providing a series of removable elements or plugs which are positioned in spaced relation to each other on the periphery of the rotary elements, and are accessible for adjustment through an opening in the inclosed casing. The opening is so positioned in the casing that the removable elements pass in registration with the opening in their path of travel, so that access to any one of the adjusting elements may be obtained by merely rotating the fan blade to the desired position. After adjustment is attained, the opening through the casing may be sealed by a suitable air-tight closure.

The preferred means whereby my invention may be carried out, will be hereinafter fully set forth in the following description which pertains to the accompanying drawings. The essential features will be summarized in the claims.

In the drawings, Fig. 1 is an elevation of a suction producing unit having my invention embodied therein; Fig. 2 is a section taken on the correspondingly numbered line in Fig. 1.

My invention broadly is concerned with means whereby a rotary element may be dynamically balanced within an inclosed casing without dismantling the unit and without separating the members of the casing. I have shown my invention in connection with a suction producing unit wherein fan blades 8, 9 and 10 are mounted on a shaft 11 which forms an extension of the armature 12 of an electric motor. This shaft is shown as journaled at one end at 13 in a frame 14, and at the other end at 15 in a fan casing 16. The fan casing surrounds the fan blades and provides a passageway for air through the unit.

To attain approximate dynamic balancing of the fan blades, the usual proceeding has been to balance the fan blade 8 on the shaft 11, then to add the blades 9 and 10 successively and to adjust the assembled device after each blade is added. Then after the entire unit is balanced, the casing is fastened in position to completely inclose the suction producing means. While this method of procedure is satisfactory for approximate adjustment, nevertheless considerable time is necessitated for accurate adjustment particularly in machines wherein the rotative speed is comparatively high, as for instance 9,000 R. P. M. Accordingly, to permit the desirable fine degree of accurate balancing, particularly when the suction producing means are mounted within an inclosed casing, I provide removable elements, shown as plugs 20 which are threaded to engage corresponding openings 21 in the fan blades. For convenience, these openings extend radially through vanes 22, which as illustrated comprise upstanding curved partitions each of which terminates at one end adjacent the periphery of the blade. Access to these plugs may be had through an opening 25 at the side of the casing which opening is in registration with the path of travel of the various openings 21 in the fan blade.

To balance the rotary suction producing unit in accordance with my invention, it will only be necessary to obtain an approximate

balancing while the fan blades are on the shaft and outside the casing and then to obtain the accurate degree of balancing after the casing is placed in position. This is obtained by the insertion of a tool, such as a screw driver 26, through the opening 25 whereby the plugs 20 may be readily accessible. Accurate balancing may be obtained by removing a plug from one opening and transferring it to another and the still finer adjustments are then made by screwing the properly selected plug in or out, thus moving its weight toward and away from the center, until the desired result is obtained. Then the opening 25 is sealed as by a plug 30 as shown in Fig. 1.

It will be seen that my invention provides means whereby rotary elements may be dynamically balanced within an inclosed casing without necessitating the removal of the rotary parts and without requiring a dismantling of the various sections of the casing. Accordingly, by making an approximate balancing before the casing is positioned over the rotary elements, and by thereafter securing the final balancing, considerable reduction in time required for accurate balancing is effected. In addition, the unit may be subsequently rebalanced, if necessary after the apparatus is in service, without removing the casing.

I claim:—

1. In combination, a rotary element, an inclosed casing therefor, and removable balancing members mounted on said element so as to be movable radially with reference thereto, said casing having an opening therein whereby said members may be rendered accessible for adjusting purposes.

2. In combination a rotary fan blade having threaded openings therein, an inclosed casing therefor, adjustable balancing means in threaded engagement with said openings, and means whereby access to said blade may be had through the casing for adjusting said balancing means.

3. In combination, a fan blade, means for rotating the blade, a housing surrounding the blade and providing a passageway for fluid set in motion by the blade, said blade having a plurality of openings extending radially around the periphery thereof, and said casing having an opening in registration with the path of travel of the openings in the fan blade, whereby access to said openings in the fan blade may be had for balancing purposes without dismantling the casing.

4. In combination, a fan blade, means for rotating the blade, a casing inclosing the fan blade, a plurality of spaced threaded openings extending radially in the fan blade, threaded plugs adapted to be inserted in said openings, and said casing having an opening in registration with those on the blade whereby said plugs may be selectively adjusted through the casing opening for balancing purposes, and means for closing the opening in the casing.

5. In combination, a rotatable shaft, a plurality of fan blades mounted thereon, a casing surrounding the blades and providing a support for said shaft, said blades being approximately balanced dynamically before the shaft is journaled in the casing, one of said blades having threaded members extending radially adjacent the periphery thereof, said casing having an opening substantially in the same plane as the members whereby said members may be adjusted independently by radial movement with reference to the blades by a tool inserted through the opening, and a closure for said opening.

In testimony whereof, I hereunto affix my signature.

CLINTON H. HANSON.