Sept. 26, 1933. D. B. REPLOGLE 1,928,075

DOUBLE CENTRIFUGAL FAN AND PROCESS OF MAKING THE SAME

Filed Feb. 6, 1929 2 Sheets-Sheet 1

Fig. 1.

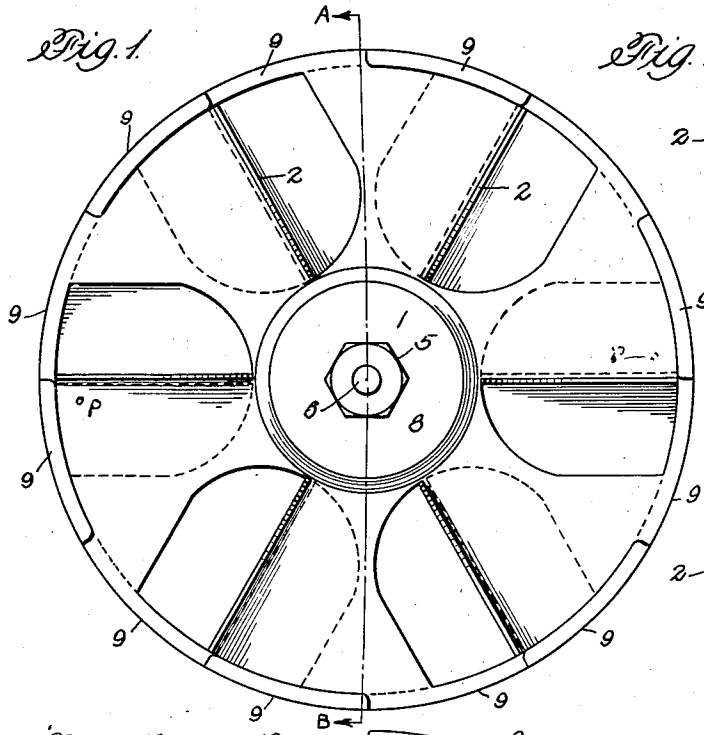


Fig. 2.

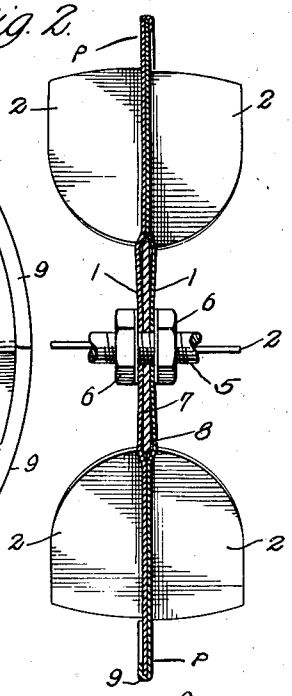


Fig. 3.

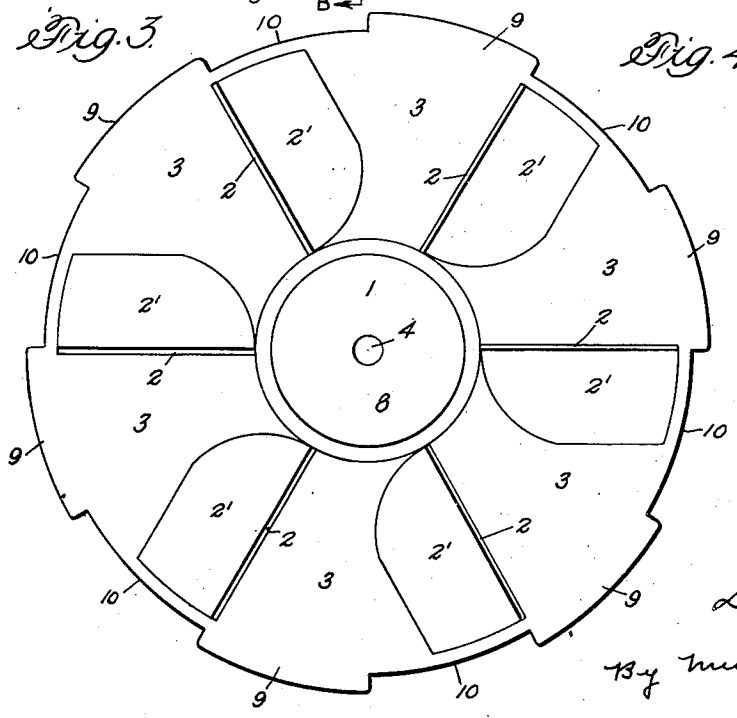
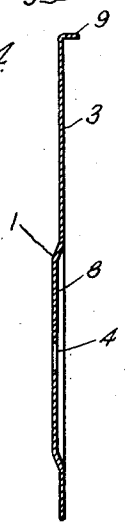


Fig. 4.



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DOUBLE CENTRIFUGAL FAN AND PROCESS OF MAKING THE SAME

Filed Feb. 6, 1929 2 Sheets-Sheet 2

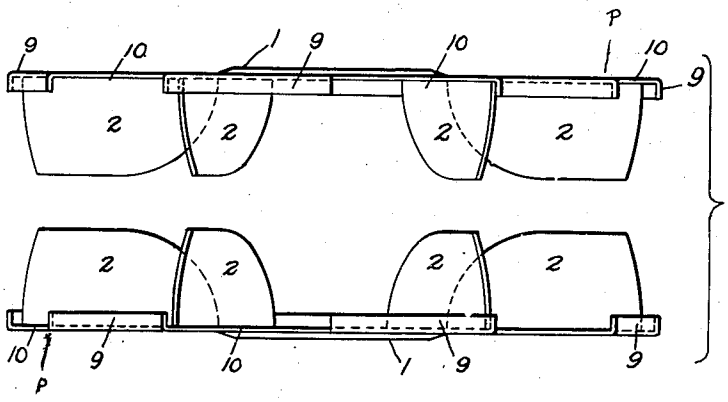
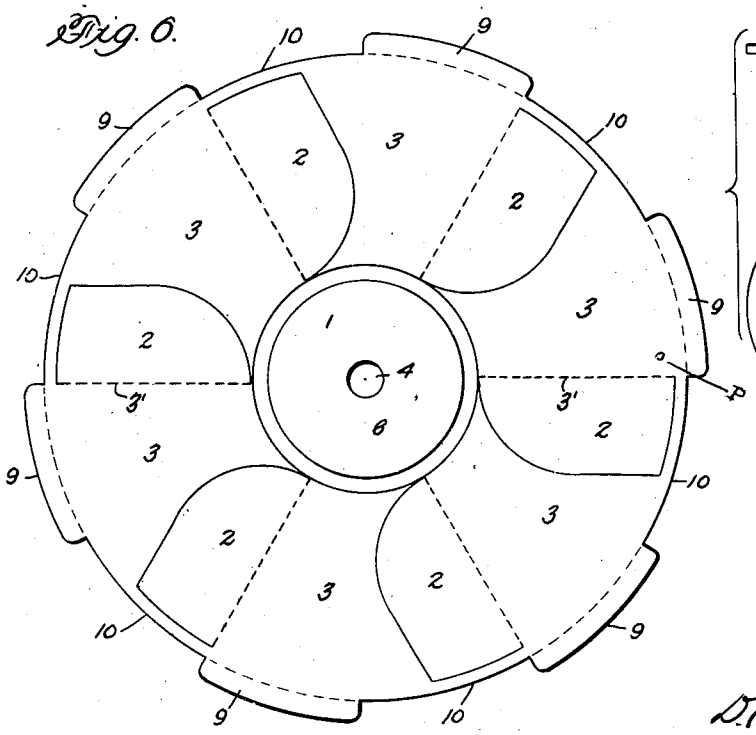


Fig. 5.

Fig. 6.



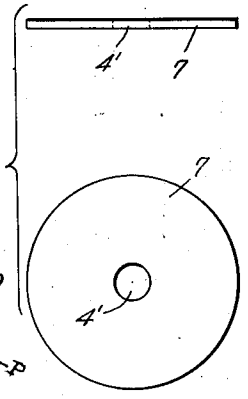


Fig. 7.

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DOUBLE CENTRIFUGAL FAN AND PROCESS OF MAKING THE SAME

Daniel Benson Replogle, Berkeley, Calif.

Application February 6, 1929. Serial No. 337,909

23 Claims. (Cl. 29—156.8)

This invention relates to centrifugal fans, such as are used to produce a current of air in connection with apparatus for suction cleaning and the like, and has for its objects the construction of a light-weight fan having a central disk with blades extending from either side thereof; a construction simplifying the balancing of such fans; a construction designed to give stability and strength to such fans, and a construction adapted to directing a current serially through the opposite sides of such fans.

The invention relates to the product as well as to the process of manufacturing the same. To these ends, the device consists of the form, arrangement and construction of parts as described herein and illustrated in the accompanying drawings, in which

Fig. 1 is a plan view of one of my fans complete, as it appears when mounted on a shaft by which it is to be revolved;

Fig. 2 is a cross-section of the main parts of the fan taken on the line A—B of Fig. 1;

Fig. 3 illustrates one of the two members which constitute, when clinched together, the middle partition and most of the main body of the fan;

Fig. 4 shows a radial sectional view of part of the disk shown in Fig. 3, when a lip 9 on the periphery thereof is bent over at right angles;

Fig. 5 is an edge view of a pair of identical stampings with portions bent over, in manner to be assembled with each other, to make the middle partition, blades and most of the body of the fan.

Fig. 6 is a plan view showing a blank and places for bending thereof to constitute one of the pair of stampings entering into the body of the fan;

Fig. 7 is a plan and edge view of a stiffening disk adapted to be interposed centrally between the pair of stampings entering into the body of the fan.

Similar characters of reference denote like and corresponding parts throughout the views.

A disk of sheet metal 1 is provided with radial tongues or blades 2—2—2 etc., which are cut from the holes 2'—2'—2' etc., from the radial sections 3—3—3 etc., of said disk, the blades being bent up along the radial lines 3'—3'—3' etc. The disk 1 is provided with a plurality of lips 9—9—9 etc., of a width adapted to fit into the notches 10—10—10 etc. of an opposing placed disk, as is clearly shown in Fig. 5, where the lips to be bent over are in juxtaposition to the spaces into which they are to be fitted. A disk 7 is centrally placed, so as to be included between the two main disks of the fan in the pocket 8, centrally formed to receive it, the bore 4' in said disk registering with the bores 4—4 through the main disks. It is apparent that the upstanding blades 2—2—2 etc. will extend through the openings 2'—2'—2' etc., interchangeably with each other, so that they may be brought into direct line and stand substantially opposite each other on the finished fan, the radial portions 3—3—3 etc., of each blank also interchangeably covering the holes 2'—2'—2' etc. of each.

It is also apparent that the lips 9—9—9 etc. will interchangeably fall into the spaces 10—10—10 etc., locating the said blades circumferentially and positively opposite each other, after which the lips 9—9—9 etc., are alternately lapped over, right and left, locking the two disks circumferentially together, and exposing an even and regular circumferential boundary.

The pocket 8 is designed to be slightly larger in width than the thickness of stiffening disk 7, so that when it is mounted on the shaft 5, and the nuts 6—6 are driven inwardly, the central portions of the disk 1 will slightly spring inward to brace and further strengthen the central portion of the fan, and hold the two opposing disks flatly and securely in contact with each other along the radial portions 3—3—3. This arrangement will serve to prevent leaks of air, which might otherwise escape from one side of the fan to the other by reason of the radial portions 3—3—3 etc. failing to completely seal over the cut-out portions 2'—2'—2' etc.

It should be understood that in the process of stamping out blanks, there may be slight imperfections, or a slight eccentricity in placing the bore 4, so that a fan formed from a single stamping may fail to balance when mounted on its shaft; also where the blades are on only one side, the great centrifugal strains at high speeds would tend to produce a dished form, convexing toward the blade side. To insure static balance, I place the blanks so that any point as *p* stamped by a certain part of the die on the blanks when assembled are reversed 180° circumferentially, thus making the imperfections of each balance one another. Facing the blanks against each other, will also obviously prevent both from dishing under centrifugal strain, since they will brace each other.

Having thus described the construction of the fan, and the process of making the same, what I claim and desire to secure by Letters Patent is,

1. A double centrifugal fan comprising a continuous middle partition with no openings there-

through and carrying blades on either side thereof integral with the middle portion.

2. The herein described double centrifugal fan comprising a continuous middle partition with no openings therethrough, and separate sets of blades, arranged on either side of said partition, said partition being composed of a pair of like plates, each carrying a set of blades integral therewith.

3. A fan or like article, essentially composed of a pair of pliant disks secured together and constituting a continuous, composite, central partition, each individual disk having a series of holes, a like number of tongues or blades adjacent said holes, and said tongues or blades of each extending interchangeably through the holes of the other, each blade operating on one side only of the central partition.

4. The method of constructing a fan or like article, comprising essentially, cutting in a pair of pliant metal blanks a like series of holes, and bending over a like series of tongues from said metal blanks, both blanks having like series of equally spaced notches and lips in their peripheries, placing said blanks face to face with the notches, and holes of one in juxtaposition with the lips and tongues of the other, and with the unperforated portions of one blank covering the openings in the other, and then clinching the lips of each periphery interchangeably over the space portions of the periphery of the other.

5. A double centrifugal fan or the like comprising a central, continuous, composite partition formed from a pair of disks, each disk having blades formed integral therewith, the blades of each disk extending through a series of correspondingly spaced openings in the other disk in the completed fan, each blade operating on one side only of said partition, and means for securing the disks together at their peripheries.

6. A double centrifugal fan or the like comprising a central, continuous, composite partition formed from a pair of disks, each disk having blades formed integral therewith, the blades of each disk extending through a series of correspondingly spaced openings in the other disk in the completed fan, each blade operating on one side only of said partition, and means for securing the disks together, said means comprising a plurality of spaced peripheral lips on at least one of said disks, said lips of one disk extending back toward the center of the disk over portions of the periphery of the other disk.

7. A double centrifugal fan or the like comprising a central, continuous, composite partition formed from a pair of disks, each disk having blades formed integral therewith, the blades of each disk extending through correspondingly spaced openings in the other disk in the completed fan, each blade operating on one side only of said partition, and peripheral lips on at least one of said disks extending back toward the center of the disk over portions of the periphery of the other disk for securing the disks together.

8. A double centrifugal fan comprising a central continuous composite disk composed of two plates secured together and having no openings therethrough, and blades formed integral with said plates and extending laterally from the central disk in the completed fan, and each blade operating on one side only of the central disk.

9. A fan or like article comprising a composite middle partition composed of a pair of pliant disks suitably secured together, each having a series of holes therein, and a like number of blades adjacent said holes, said blades of each disk extending through the holes of the other, and the unperforated portions of each disk covering the holes in the other disk so that passage of air through the partition is prevented.

10. A fan comprising a composite partition and two sets of blades arranged in oppositely disposed pairs, one on one side and the other on the other side of the partition, said partition comprising a pair of disks each having one set of said sets of blades formed integral therewith, the blades of each disk extending through a series of openings in the other disk in the completed fan, the composite partition providing a continuous wall preventing passage of air from one side of the partition to the other.

11. A fan comprising a central partition having no openings therethrough and two sets of blades formed integral therewith disposed substantially at right angles to the plane of the partition and arranged in oppositely disposed pairs, one blade of each pair operating wholly on one side and the other wholly on the other side of the central partition.

12. A fan comprising a central partition and two sets of blades formed integral therewith disposed substantially at right angles to the plane of the partition and arranged in oppositely disposed pairs, one blade of each pair operating wholly on one side and the other wholly on the other side of the central partition, said partition comprising a pair of disks each having a set of said blades formed integral therewith, the blades of each disk extending through a series of openings in the other disk in the completed fan.

13. A fan comprising a pair of disks each having integral projecting blades, the blades of each disk extending through a series of correspondingly spaced openings in the other disk in the completed fan, each blade located wholly on the side opposite the disk from which it projects, and means for securing the disks together.

14. A fan comprising a pair of outer disks each having blades formed integral therewith, the blades of each disk extending through a series of spaced openings in the other disk and the openings in each disk being covered by the unbroken portion of the other disk in the completed fan, a spacing disk of less diameter than the two outer disks interposed between the two said disks, a hub extending through the centers of the three disks, means for clamping the two outer disks against the inner disk, and means for securing the two outer disks together at their peripheries.

15. A double centrifugal fan comprising a flat middle partition having no openings therethrough, two sets of blades formed integral with the partition, one set of blades extending laterally from the central partition on one side only and the other set of blades on the other side only, each set of blades serving as a complete fan operating on one side only of the central partition and independent of the other set of blades.

16. A double centrifugal fan comprising a flat middle partition, two sets of blades formed integral with the partition, one set of blades extending laterally from the central partition on one side only and the other set of blades on the other side only, each set of blades serving as a complete fan operating on one side only of the central partition and independent of the other set of blades, said middle partition being without openings, and providing a continuous wall

preventing passage of air from one side of the partition to the other.

17. A fan comprising a middle partition composed of two like disks secured together, two sets of blades extending laterally from the central partition, one set on one side and the other on the other side, said composite middle partition being without openings and providing a continuous wall preventing passage of air from one side of the plate to the other.

18. An article of manufacture comprising a continuous, composite, flat plate with no openings therethrough, composed essentially of a pair of pliant metallic individual plates, each individual plate having openings therein covered by unperforated portions of the other and having a like series of peripheral notches or spaces, a corresponding series of peripheral lips on said individual plates, and the individual plates faced so that the lips of each interchangeably fit into the notches or spaces of the other, all of said lips of each being lapped over corresponding portions of the periphery of the other for securing the plates together.

19. A centrifugal fan comprising two disks of yielding material placed back to back, fan blades mounted upon each disk, each disk having a central cup-shaped depression on its inner side, a spacing disk in the cups of less thickness than the combined depths of the cups, and means for clamping the central portions of the cups against the spacing disk.

20. The method of making a balanced fan which comprises making a plurality of like stampings carrying blades, and assembling said stampings with their surfaces facing each other and with each point on the surface of one stamping placed diametrically opposite the point of the corresponding surface of the other stamping which contacts with the same point of the die or stamping element in the operation of forming the stamping, whereby the unbalancing effect of any defect in the stampings will be neutralized.

21. The method of constructing a fan or the like comprising cutting in a pair of pliant metal blanks a like series of openings and bending over a like series of tongues from said metal blanks, placing said blanks face to face with the tongues of one extending through the holes of the other, and with the unperforated portions of one blank covering the openings in the other, and then securing the blanks together.

22. A double centrifugal fan comprising a middle sheet metal partition with no openings therethrough and carrying blades on either side thereof struck from the middle partition.

23. A balanced fan comprising a pair of like stampings carrying blades and having means securing the stampings together with their surfaces facing each other, and with each point on the surface of one stamping located diametrically opposite the point of the corresponding surface of the other stamping which contacts with the same point of the die or stamping element in the operation of forming the stamping, whereby the unbalancing effect of any defect in the stampings will be neutralized.

DANIEL BENSON REPLOGLE.