Aug. 24, 1965 S. W. KLONOSKI 3,201,857

METHOD OF MAKING FAN WITH SLINGER RING

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Fig. 1

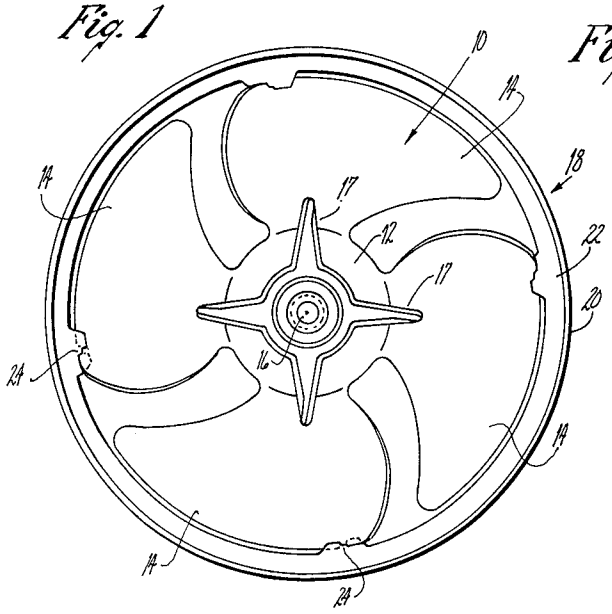


Fig. 2

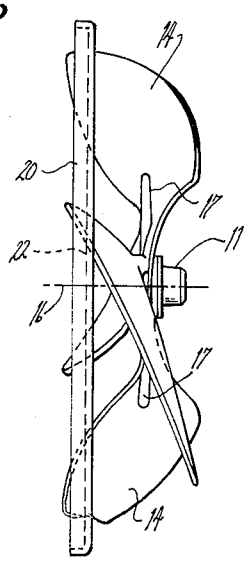


Fig. 4

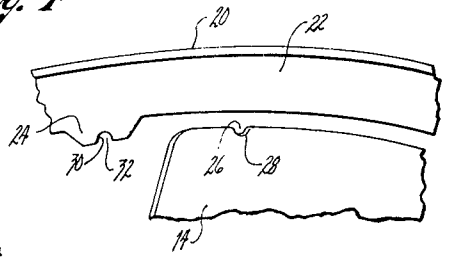


Fig. 3

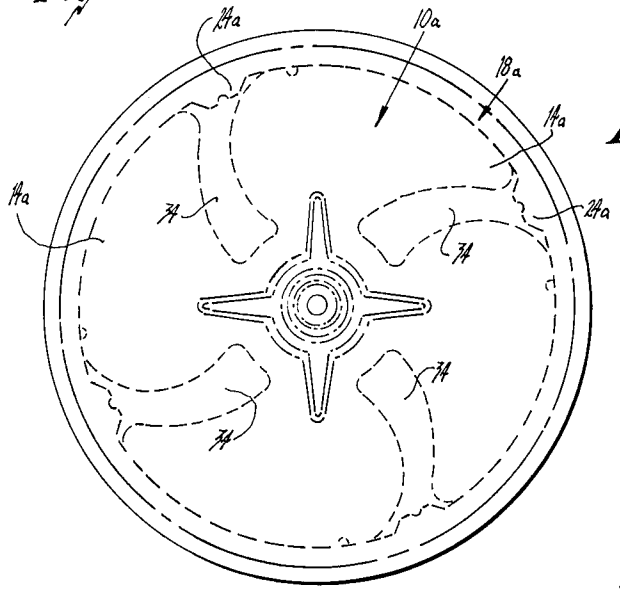
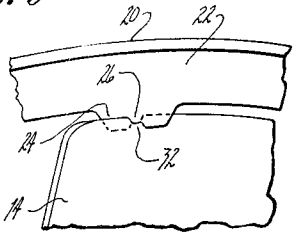


Fig. 5



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Fig. 6

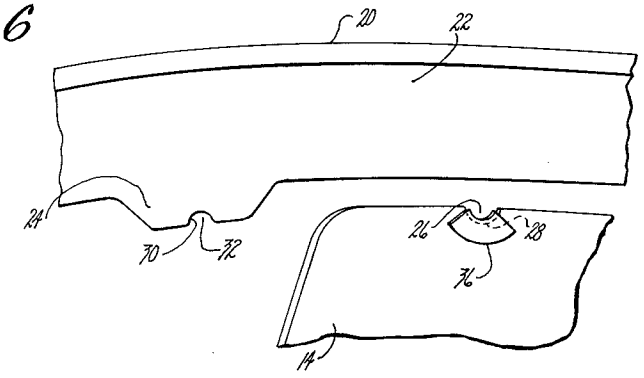


Fig. 7

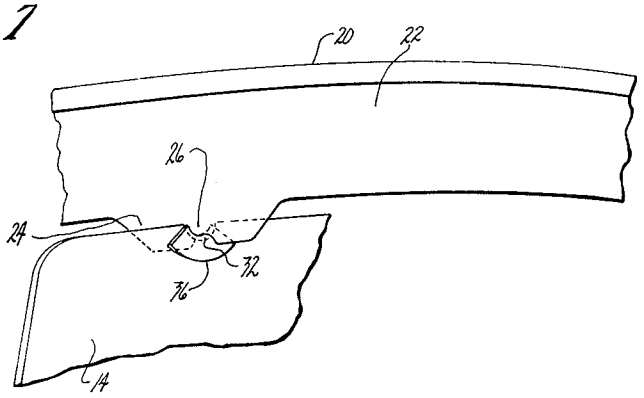
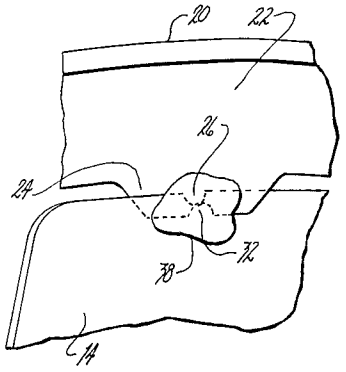


Fig. 8



United States Patent Office 3,201,857 Patented Aug. 24, 1965

3,201,857

METHOD OF MAKING FAN WITH SLINGER RING

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Filed Mar. 21, 1963, Ser. No. 267,057
7 Claims. (Cl. 29—156.8)

This invention relates to air moving fans and, more particularly, to air moving fans having attached slinger rings adapted to raise water upwardly from a sump or the like by capillary action for entrainment in an air stream generated by the fan. This application is a continuation-in-part of my Patent No. 3,111,173, issued November 19, 1963, on Fan With Slinger Ring.

The invention has for its general object the provision of an improved method for making a fan and slinger ring from a single sheet metal blank whereby to achieve a substantial economic advantage.

The drawings show several embodiments of the method of the invention and such embodiments will be described, but it will be understood that various changes may be made from the methods disclosed, and that the drawings and description are not to be construed as defining or limiting the scope of the invention, the claims forming a part of this specification being relied upon for that purpose.

Of the drawings:

FIG. 1 is a front view of a fan with an attached slinger ring made in accordance with a preferred embodiment of the method of the invention.

FIG. 2 is a side view of the fan and slinger ring of FIG. 1.

FIG. 3 is a front view of a single sheet metal blank from which the fan and slinger ring of FIGS. 1 and 2 may be formed.

FIG. 4 is an enlarged fragmentary front view showing a portion of the slinger ring of FIG. 1 and an outer edge portion of one blade of the fan of FIG. 1, the fan and slinger ring being in detached positions.

FIG. 5 is an enlarged fragmentary front view similar to FIG. 4, but showing the parts in connected positions.

FIG. 6 is an enlarged fragmentary front view similar to FIG. 4 but illustrating a method forming a second embodiment of the invention.

FIG. 7 is an enlarged fragmentary front view similar to FIG. 5, but referring to the method of FIG. 6.

FIG. 8 is an enlarged fragmentary front view similar to FIG. 7 but illustrating a method forming a third embodiment of the invention.

In accordance with the present invention and in fulfillment of the above-mentioned object thereof, a fan and a slinger ring therefor are formed separately but from a single sheet metal blank. The fan is adapted for rotation about a central axis and comprises a plurality of similar circumaxially spaced generally radial blades which are arranged at similar pitch angles. The slinger ring is adapted to extend around the fan adjacent the outer edge portions of the fan blades. The fan is formed from a central portion of the sheet metal blank and the slinger ring is formed separately from an annular portion of the blank around said central portion. In forming the fan and slinger ring, provision is made for the connection of the ring to and around the fan without the use of separate connecting means. Thus, substantial savings in material and overall production costs are realized.

Referring now particularly to FIGS. 1 and 2 of the drawings, it will be observed that a fan indicated generally at **10** includes a hub **11**, a central hub section **12** and integral blades **14, 14**. Four blades **14, 14** are shown and they extend generally radially from the hub section **12** for rotation about a central hub axis **16**. The blades are equally spaced circumaxially and are arranged at similar

pitch angles for their air moving function as best shown in FIG. 2. A strengthening rib **17** is preferably formed for each blade **14** and extends generally radially from and on the central hub section **12** outwardly on and throughout a portion of the radial dimension of the blade.

A slinger ring indicated generally at **18** comprises a body portion **20** and an annular radially inwardly projecting flange **22**. A plurality of tabs **24, 24** are formed on the flange **22** and project radially inwardly therefrom. Four tabs **24, 24** are provided when the fan has four blades as shown and said tabs are equally spaced circumaxially around the flange **22**.

In FIGS. 1 and 2, the slinger ring **18** is shown detachably connected to the fan **10** and, more specifically, said ring is detachably connected to the outer edge portion of each blade **14** of the fan and the ring extends around said outer edge portions of the blades. The means by which the fan and slinger ring are detachably connected together in the FIGS. 1 and 2 embodiment of the invention includes interengaging or interlocking notches and, more specifically, said means includes interengaging or interlocking edges or walls of such notches. As best shown in FIGS. 4 and 5, each of the fan blades **14, 14** has a notch **26** formed in its outer edge portion. Each of the notches **26, 26** opens outwardly and the several notches **26, 26** are arranged in an annular series in a common radial plane as best illustrated in FIG. 2. The base portion of the edge **28** of each notch **26** provides a generally radially outwardly facing surface which is engageable with a generally radially inwardly facing surface on the slinger ring **18** to connect the said ring to the fan **10**. The said generally radially inwardly facing surface may comprise an inner edge on the slinger ring such as an inner edge of a tab **24** but in the preferred embodiment of FIGS. 1, 2, 4 and 5, said surface constitutes the base portion of an edge **30** of a notch **32** in the tab **24**. That is, each of the tabs **24** has an inwardly open notch **32** formed therein with an edge **30** and the base portions of said notch edges respectively engage the base portions of the edges **28, 28** of the notches **26, 26** when the fan and slinger ring are detachably connected together.

As best seen in FIGS. 1 and 5, the diameter of the inner edges of the tabs **24, 24** is somewhat less than the peripheral diameter of the fan blades **14, 14**. That is, the outer edges of the fan blades **14, 14** project outwardly beyond the inner edges of the tabs **24, 24** when the fan and slinger ring are connected together. The depths of the notches **26, 26** and the notches **32, 32** are such that the base portions of their respective edges **30, 30** and **28, 28** firmly engage each other in an interference fit when the fan and slinger ring are so connected. To effect this notch-to-notch connection of the fan with the slinger ring, the fan blades **14, 14** are flexed to reduce their peripheral diameter and are thereafter released when the fan and slinger ring have been moved relatively so that the blade and tab notches are in registry with each other. Thereafter, the side portions of the notch edges **28, 28** and the notch edges **30, 30** prevent relative rotation between the fan **10** and the slinger ring **18** and they also prevent relative axial movement between said elements.

From the foregoing, it will be apparent that the selective connection of the slinger ring **18** with the fan **10** at axially spaced positions may be readily provided for. The outer edge portions of the fan blades **14, 14** each lie in a common imaginary cylinder having its center line coincident with the axis **16** of the fan as best shown in FIG. 1. Thus, the said edge portions are equidistant from the axis **16** and the slinger ring may be readily attached thereto at selected axially spaced positions merely by providing appropriate additional blade notches similar to the notches **26, 26** but spaced axially from said notches. Although only one set of blade notches **26,**

26 are shown, it is within the scope of the invention to provide several sets or annular series of such blade notches 26, 26 permitting the slinger ring 18 to be attached to the fan 10 at selected axially spaced positions.

In FIG. 3 there is shown a single sheet metal blank from which the fan and slinger ring of FIGS. 1 and 2 may be formed in carrying out the method of the present invention. The fan 10 may be formed from a central portion 10^a of the blank and the slinger ring 18 may be formed from an annular portion 18^a of said blank around said central portion 10. The particular cutting and forming operations employed in carrying out the method of the present invention may be conventional and the said operations as well as the sequences in which they are performed need not be described in detail herein. It will suffice to point out that the fan 10 and slinger ring 18 may be provided by cutting and forming along the various cut and bend lines shown respectively in dot and dot-dash line form in FIG. 3. It is important to note, however, that the tabs 24, 24 on the flange 22 of the slinger ring are or may be formed of sections 24^a, 24^a in remaining parts 34, 34 of the blank disposed between parts 14^a, 14^a from which the blades 14, 14 are formed. Thus, the aforementioned desired relationship of the diameters of the inner edges of the tabs 24, 24 and the outer edges of the blades 14, 14 may be provided for. That is, the tabs 24, 24 may be formed so as to project radially inwardly beyond the outer edges of the blades 14, 14 when the fan and slinger ring are assembled and connected together.

After the blank of FIG. 3 has been cut and formed as required to separately provide the fan and slinger ring of FIGS. 1 and 2, the said two elements may be detachably connected together by flexing the blades to reduce their peripheral diameter as described above. In one assembly procedure, the fan and the slinger ring may be moved axially with respect to each other so that the slinger ring is disposed around the fan with the fan blades 14, 14 disposed between the tabs 24, 24. Thereafter, the fan and the slinger ring may be rotated with respect to each other to engage the outer edge portions of the fan blades 14, 14 with the tabs 24, 24 and to bend or flex the blades whereby to reduce their peripheral diameter permitting the snap engagement of the blade notches with the tab notches. In an alternative assembly procedure, the fan blades 14, 14 may be flexed simultaneously to reduce their peripheral diameter with the slinger ring and fan held apart. Thereafter the slinger ring may be moved axially to a position around the fan wherein the tab notches 32, 32 are in registry with the blade notches 26, 26. Subsequent release of the blades 14, 14 will result in interengagement of the tab and blade notches with a snap movement and will effect the desired connection of the slinger ring with the fan.

A fan and slinger provided in the practice of the aforedescribed method is desirably simple and durable in construction and provides a significant economic advantage in manufacture. The majority of operating conditions are served well by such a fan but for very severe conditions of operation it may be desirable to provide means for avoiding noise and wear which may result from relative movement between engaging metallic portions of the fan blades and the slinger ring at the notch-to-notch connections. In a first alternative embodiment of the method this is accomplished in an additional method step wherein small non-metallic elements are provided in each notch-to-notch connection between otherwise engaging metallic portions. Thus, a small non-metallic strip of a material such as Teflon may be folded over a notch edge as illustrated at 36 in FIG. 6. This may be accomplished with respect to either the blade or tab notches 26, 32 before assembly of the fan and slinger ring as indicated in FIG. 6. A suitable adhesive may of course be employed to secure the strip in place.

On assembly of the fan and slinger ring as described above, the strip 36 is disposed between the notch edges as illustrated in FIG. 7 and metal-to-metal contact is avoided whereby to reduce if not eliminate noise and wear under even the most severe operating conditions.

In accordance with still another alternative embodiment of the method of the invention an additional method step includes the provision of a means securing the adjacent metallic portions in a notch-to-notch connection in fixed relationship. The said means may take the form of a material having fluid and solid states and, as presently preferred, a plastic material may be employed. Application of the material to the notch-to-notch connection is of course accomplished with the material in a fluid state and may be accomplished before or after assembly of the fan and slinger ring, the latter being presently preferred. Thereafter the material is conditioned, as for example by mere air curing in the case of a plastic, to bring it to its solid (at least semi-rigid) state and it serves to secure the adjacent metallic portions in fixed relationship with respect to each other and to thereby prevent noise and wear.

Referring particularly to FIG. 8 the material referred to is designated at 38 and will be seen to substantially cover and envelop the notch-to-notch connection shown. The material may be regarded as being in its solid state and serving to fix the connection as described in a completed fan and slinger ring assembly.

The invention claimed is:

1. A method for making a fan and attached slinger ring comprising the steps of providing a single sheet metal blank, cutting and forming a central portion of said blank to provide a fan having a central hub section and a plurality of integral circumaxially spaced generally radial fan blades which are arranged at similar pitch angles and which have notches in their outer edge portions which notches are arranged in an annular series approximately in a common radial plane, cutting and forming a generally annular portion of said blank around said central portion to provide a slinger ring having a body and a plurality of integral circumaxially spaced generally radial tabs which are formed of remaining parts of the blank disposed between the openings left by the fan blades and which project inwardly beyond the outer edges of said openings so as to have an inner edge diameter smaller than the peripheral diameter of the fan blades, providing inwardly open notches in said tabs and flexing the fan blades to reduce their said peripheral diameter whereby to interengage said blade and tab notches and thereby connect said slinger ring to and around said blades.

2. The method for making a fan with attached slinger ring as set forth in claim 1 wherein the slinger ring is formed with an integral annular flange which projects radially inwardly and wherein said radial tabs are formed on said flange and project radially inwardly therefrom.

3. The method for making a fan with attached slinger ring as set forth in claim 2 wherein the step of detachably connecting the slinger ring to and around the fan blades is carried out by first moving the fan blades axially to a position within the slinger ring and between the radial tabs thereon and by thereafter effecting relative rotation of the ring and fan blades to engage the outer edges of the blades with the tabs and to thereby flex the same and reduce their peripheral diameters to interengage the tab and blade notches with a snap movement.

4. The method for making a fan with attached slinger ring as set forth in claim 1 and including the additional step of providing a means in each notch-to-notch connection for preventing noise and wear resulting from relative movement between engaging metallic portions of the blades and slinger ring.

5. The method for making a fan with attached slinger ring as set forth in claim 4 wherein said additional step includes the provision of a small non-metallic element in each notch-to-notch connection between otherwise engaging metallic portions of the blades and slinger ring.

6. The method for making a fan with attached slinger ring as set forth in claim 4 wherein said additional step includes provision of a material having fluid and solid states and the application of such material to each notch-to-notch connection in its former state and the subsequent conditioning of the same to bring it to its latter state wherein it secures adjacent metallic portions in the connection in fixed relationship to each other.

7. The method for making a fan with attached slinger ring as set forth in claim 4 wherein the material provided is of a non-metallic nature and wherein the application thereof to the notch-to-notch connections is accomplished subsequent to the assembly of the said connections.

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