

Dec. 27, 1938.

K. D. McMAHAN

2,141,923

VENTILATING APPARATUS

Filed April 16, 1936

2 Sheets-Sheet 1

Fig. 1.

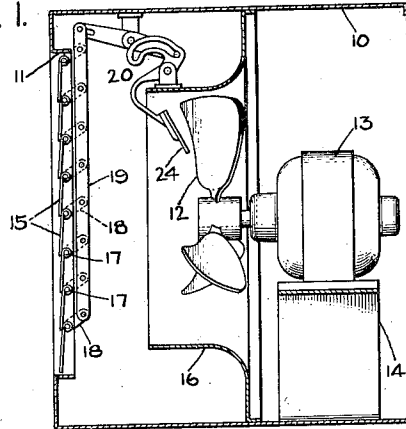


Fig. 2.

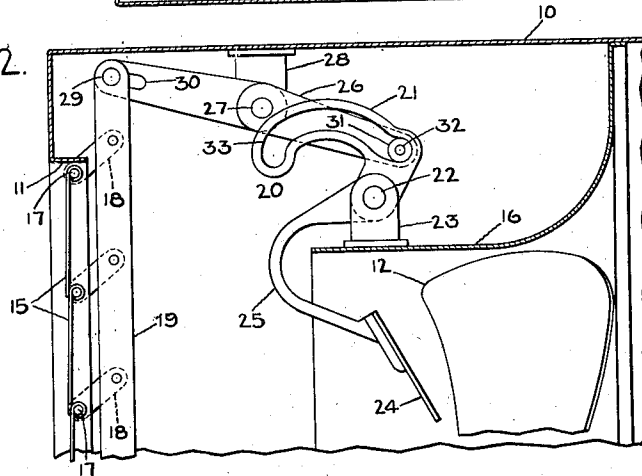
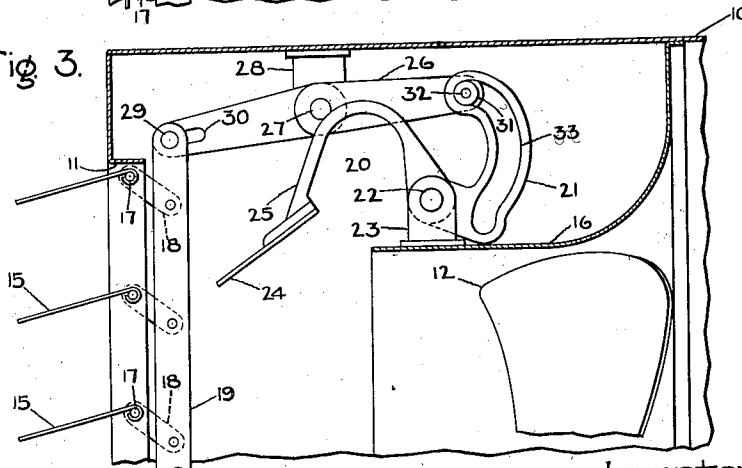


Fig. 3.



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2 Sheets-Sheet 2

Fig. 4.

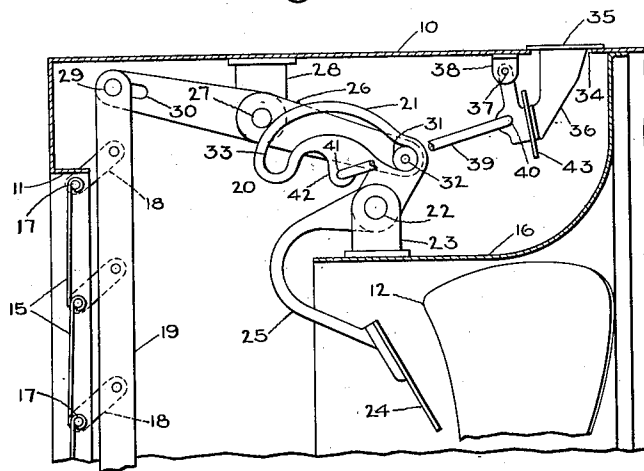
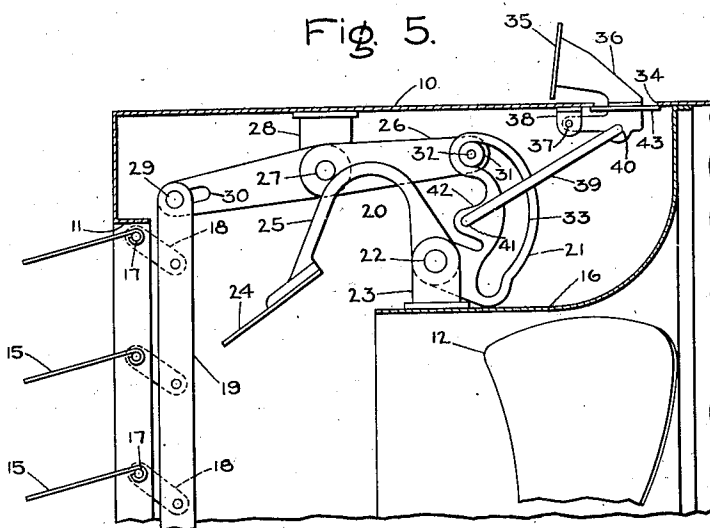


Fig. 5.



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UNITED STATES PATENT OFFICE

2,141,923

VENTILATING APPARATUS

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Application April 16, 1936, Serial No. 74,630

15 Claims. (Cl. 98—116)

My invention relates to ventilating apparatus and particularly to such apparatus having an air discharge opening provided with an automatic shutter mechanism.

5 Ventilating devices such as exhaust fans for buildings are frequently provided with automatic shutters for closing the discharge outlet when the fan is not in operation, in order to prevent the blowing of dust or rain into the apparatus or building. The shutter mechanism is sometimes
10 constructed so that it will be opened upon operation of the fan either by the force of the air circulated by the fan or by some device actuated by the starting of the fan. The shutters commonly comprise a plurality of vanes arranged to move in unison so that they are all opened or closed at the same time. When the ventilating
15 apparatus is not in operation the shutters may become noisy, especially during stormy weather, and various arrangements have been provided for locking the shutters in their closed position so that they cannot rattle. The shutters may also vibrate and produce noise when in their open position during the operation of the fan. Accordingly, it is an object of my invention to provide
20 an air circulating device having automatically operable shutters and an arrangement for locking the shutters to prevent their rattling or vibrating in their closed position and in their open position.

Another object of my invention is to provide an air circulating device having automatically operable shutters and an arrangement for locking the shutters in their closed position and an improved arrangement for automatically unlocking the shutters.

Further objects and advantages of my invention will become apparent as the following description proceeds, and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

For a better understanding of my invention reference may be had to the accompanying drawings in which Fig. 1 is a side elevation, partly in section, of an air circulating device embodying my invention; Fig. 2 is an enlarged view of a portion of the device shown in Fig. 1, with the shutters locked in their closed position; Fig. 3 is the same as Fig. 2 except that the shutters are shown locked in their open position; Fig. 4 shows another embodiment of my invention with the shutters locked in their closed position; and Fig. 5 is the same as Fig. 4 with the shutters locked in their open position.

Referring now to Fig. 1, I have shown an air circulating device including a duct 10 having a discharge opening 11, a fan 12 driven by a motor 13 mounted on a base 14 within the duct, and a plurality of shutters 15 for closing the opening 11. A shroud 16 of spun metal is welded or otherwise secured in the duct 10 and provides a round edged orifice through which the air is forced by the fan. The shutters 15 are mounted on pivots 17 and have arms 18 pivoted on a connecting bar 19 which connects the shutters to operate in unison. When the motor 13 is started and drives the fan 12 the air circulated by the fan forces open the shutters 15 to permit the discharge of air from the duct 10. When the shutters 15 are in their closed position and when they are in their open position they are locked by a locking device 20 to prevent their vibrating or rattling and producing objectionable noise and wear.

The construction and operation of the locking device 20 may readily be understood by reference to Figs. 2 and 3. The locking device 20 comprises a cam 21 pivoted at 22 to a bracket 23 on the shroud 16 and arranged to be actuated by a vane 24 secured on a curved arm 25 formed integrally with or rigidly secured to the cam 21. The vane and cam as shown in Fig. 2 are in position to lock the shutters 15 when they are closed. The locking device is biased to this position by the force of gravity. An arm 26 is provided to connect the cam 21 operatively to the shutter bar 19. The arm 26 is pivoted at 27 to a stationary bracket 28 and is connected to the bar 19 by a pin 29 on the end of the bar and a slot 30 formed in the end of the arm. The other end of the arm 26 is provided with a roller 31 mounted on a pin 32 secured to the arm. The roller 31 rides within a slot 33 which comprises the guiding surface of the cam 21. When the roller 31 is in the position shown in Fig. 2, it cannot move in a vertical direction since it is held both top and bottom by the sides of the slot 33. Since the roller 31 cannot move, it holds the arm 26 stationary and thereby holds the bar 19 stationary and prevents movement of the shutters 15. When the fan 12 is started the pressure of the air circulated thereby tends to open the shutters 15 and at the same time the initial surge of air swings the vane 24 to the left. This releases the roller 31 from its position in the end of the cam slot 33 and unlocks the shutters 15 which are forced outwardly by the air and lower the bar 19. The lowering of the bar 19 rotates the arm 26 about the pivot 27 and lifts the roller 31. The cam 21 also rotates and assumes its extreme position

which is shown in Fig. 3, the vane 24 holding the cam in this position as long as air is circulated by the fan 12. The roller 31 is now at the other end of the cam slot 33 and is again held against movement in a vertical direction, thereby locking the arm 26 stationary and locking the shutters 15 in their open position. When the fan is stopped the vane 24 will fall by gravity and rotate the cam 21 and release the roller 31 from its position in the end of the slot 33. This allows the vanes 15 to fall to their closed position where they are locked again by the cam 21, as shown in Fig. 2.

In the arrangement described above the vane 24 is moved from the position in which it locks the shutters 15 closed by the velocity head of the air produced by operation of the fan 12. It is, therefore, evident that if the initial surge of air produced on starting the fan is not sufficient to move the vane 24 and release the roller 31 from its position in the cam slot 33 the shutters 15 will remain closed and a pressure head of air will be built up in the end of the duct 10. This pressure head will tend to open the vanes 15 and rotate the arm 26 in a counterclockwise direction, thereby pressing the roller 31 against the cam 33 and increasing the force necessary to rotate the cam. In installations where dust or other foreign matter is apt to collect on the linkage mechanism and increase the resistance to movement thereof, I have found it desirable to provide a device responsive to the pressure head developed in the end of the duct 10 when the shutters are closed in order to release the locking mechanism. Such an arrangement may be provided to co-operate with the locking mechanism shown in Figs. 1, 2 and 3, and I have shown such a device in Figs. 4 and 5.

The air circulating device shown in Figs. 4 and 5 is similar to that shown in Figs. 2 and 3 and corresponding parts have been given the same reference numbers. In order to utilize the pressure head developed in the duct 10 to assist in unlocking the shutters in their closed position I provide an opening 34 in the top of the duct 10 and a plate 35 arranged to cover this opening on the outside thereof when the shutters are in their closed position. Plate 35 is mounted at the end of an arm 36 pivoted at 37 to a lug 38 secured to the inside of the duct 10. The arm 36 is linked to the cam 21 by a rod 39 pivoted to the arm 36 at 40 and to the cam 21 at 41 on a lug 42 formed on the cam. When the locking mechanism is in the position shown in Fig. 4 with the shutters 15 closed and the fan 12 is placed in operation a pressure head will be built up in the end of the duct, if for any reason the vanes 15 do not open with the initial surge of air. This pressure head will lift the plate 35 from the opening 34 and rotate the arm 36 in a counterclockwise direction and thereby rotate the cam 21 in a clockwise direction since the arm 39 is linked to the cam 21 above the pivot 22. The roller 31 is thereby released from the end of the cam slot 33 and the shutters 15 are unlocked and are opened by the air circulated by the fan; the vane 24 being rotated to the position shown in Fig. 5 by the velocity head of the circulating air. When the mechanism is in the position shown in Fig. 5 and the shutters are open a plate 43 secured on the arm 36 is held in position covering the underside of the opening 34 and closing the opening. When the fan is stopped the vane 24 will fall in the same manner as during the operation of the circulat-

ing device shown in Figs. 1 to 3, and the shutters 15 will close; at the same time the arm 36 will be rotated with the cam 21 and will return to its initial position as shown in Fig. 4. The arrangement shown in Figs. 4 and 5 therefore provides a locking device for holding the shutters 15 in their closed position, which device is automatically operable to unlock the shutters in response to both the velocity head and the pressure head produced by operation of the circulating fan.

From the foregoing it is readily apparent that I have provided a locking device for the shutters at the discharge outlets of air circulating apparatus which device is automatically operable to lock the shutters in their open position and in their closed position to prevent rattling of the shutters at all times.

While I have shown and described my invention in connection with a particular type of air circulating apparatus, it is to be understood that it is applicable to other types of apparatus. I do not, therefore, desire my invention to be limited to the specific construction shown and described and I intend in the appended claims to cover all modifications thereof which do not depart from the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. An air circulating device including a duct, means for forcing air through said duct, shutter means for closing said duct, said shutter means being arranged to be opened by the force of air circulating through said duct, and means actuated by the circulation of air through said duct for locking said shutter means in its open position to prevent vibration of said shutter means during operation of said air forcing means.
2. An air circulating device including a duct, means for forcing air through said duct, shutter means for closing said duct, said shutter means being arranged to be opened by the force of air circulating through said duct, and means including a member arranged in the path of the air and utilizing the flow of air through said duct for locking said shutter means in its open position to prevent vibration of said shutter means.
3. An air circulating device including a duct, means for forcing air through said duct, shutter means for closing said duct, means for locking said shutter means in its closed position to prevent the passage of air through said duct, and means co-operating with said last-mentioned means and actuated by the force of the air circulated through said duct for unlocking said shutter means to permit opening thereof and for locking said shutter means in its open position to permit the discharge of air from said duct.
4. An air circulating device including a duct, means for forcing air through said duct, means including a plurality of shutters for closing said duct, gravity operated means for locking said shutters in their closed position, and means co-operating with said gravity operated means and actuated by the force of the air circulated through said duct for unlocking said shutters to permit opening thereof and for locking said shutters in their open position to permit the discharge of air from said duct.
5. An air circulating device including a duct, means for forcing air through said duct, means including a plurality of shutters for closing said duct, means including a cam for locking said shutters in their closed position and for locking said shutters in their open position, gravity actu-

ated means for holding said cam in position to lock said shutters in their closed position, and means actuated by the force of the air circulating through said duct for unlocking said shutters to permit opening thereof and for moving said cam into position to lock said shutters in their open position and permit the discharge of air from said duct.

6. An air circulating device including a duct, means including a power driven fan arranged in said duct for forcing air through said duct, means including an annular shroud surrounding said fan for providing an orifice having a cross-sectional area less than that of said duct, means including a plurality of shutters arranged near the discharge end of said duct for closing said duct, means including a cam pivoted on said shroud for locking said shutters in their closed position and for locking said shutters in their open position, gravity actuated means for biasing said cam in position to lock said shutters in their closed position, and means actuated by the force of the air discharged through said orifice for unlocking said shutters to permit opening thereof and for holding said cam in position to lock said shutters in their open position and permit the discharge of air from said duct.

7. An air circulating device including a duct, means including a power driven fan arranged in said duct for forcing air through said duct, means including an annular shroud surrounding said fan for providing an orifice having a cross-sectional area less than that of said duct, means including a plurality of shutters arranged near the discharge end of said duct for closing said duct, means including a cam and a linkage connecting said cam and said shutters for locking said shutters in their closed position and for locking said shutters in their open position, gravity actuated means for biasing said cam in position to lock said shutters in their closed position, and means including a vane arranged in the path of the air discharged through said orifice for unlocking said shutters to permit opening thereof and for holding said cam in position to lock said shutters in their open position and permit the discharge of air from said duct.

8. An air circulating device including a duct, means for circulating air through said duct, means including a shutter for closing said duct, said shutter being arranged to be opened by the air circulated by said circulating means, means for locking said shutter in its closed position to prevent vibration thereof, and means responsive to the pressure head produced by said circulating means when said shutter is closed for unlocking said locking means to release said shutter.

9. An air circulating device including a duct, means for circulating air through said duct, means including a shutter for closing said duct, said shutter being arranged to be opened by the air circulated by said circulating means, means for locking said shutter in its closed position to prevent vibration thereof, means responsive to the pressure head produced by said circulating means when said shutter is closed for unlocking said locking means to release said shutter, and means responsive to the velocity head produced by said circulating means for locking said shutter in its open position to prevent vibration thereof.

10. An air circulating device including a duct, means for circulating air through said duct, means including a shutter for closing said duct, said shutter being arranged to be opened by the

air circulated by said circulating means, means for locking said shutter in its closed position to prevent vibration thereof, means responsive to the velocity head produced by operation of said air circulating means for unlocking said locking means to release said shutter and for locking said shutter in its open position, and means responsive to the pressure head produced by said air circulating means when said shutter is closed for assisting said unlocking means to release said shutter.

11. An air circulating device including a duct, means for circulating air through said duct, means including a plurality of shutters for closing said duct, means including a cam for locking said shutters in their closed position and for locking said shutters in their open position, means for holding said cam in position to lock said shutters in their closed position, means actuated by the static head produced by said air circulating means when said shutters are closed for unlocking said shutters to permit opening thereof, and means actuated by the velocity head produced by said air circulating means for moving said cam into position to lock said shutters in their open position and to permit the discharge of air from said duct.

12. An air circulating device including a duct, means including a power-driven fan arranged in said duct for circulating air through said duct, means including an annular shroud surrounding said fan for providing an orifice having a cross-sectional area less than that of said duct, means including a plurality of shutters arranged near the discharge end of said duct for closing said duct, means including a cam pivoted on said shroud for locking said shutters in their closed position and for locking said shutters in their open position, means for biasing said cam in position to lock said shutters in their closed position, means actuated by the pressure head produced by the discharge of air through said orifice when said shutters are closed for unlocking said shutters to permit opening thereof, and means actuated by the velocity head of the air discharged through said orifice for holding said cam in position to lock said shutters in their open position and permit the discharge of air from said duct.

13. An air circulating device including a duct, means for circulating air through said duct, means including a plurality of shutters for closing said duct, means including a cam for locking said shutters in their closed position and for locking said shutters in their open position, means for holding said cam in position to lock said shutters in their closed position, means including an opening in said duct and a plate arranged to cover said opening and actuated by the static head produced by said air circulating means when said shutters are closed for unlocking said shutters to permit opening thereof, and means actuated by the velocity head produced by said air circulating means for moving said cam into position to lock said shutters in their open position and permit the discharge of air from said duct.

14. An air circulating device including a duct, means for circulating air through said duct, means including a plurality of shutters for closing said duct, means including a cam for locking said shutters in their closed position and for locking said shutters in their open position, means for holding said cam in position to lock said shutters in their closed position, said duct having an opening in the wall thereof and a plate pivotally

mounted on said duct for closing said opening, means including a link connecting said plate and said cam for unlocking said shutters to permit opening thereof, and means actuated by the velocity head produced by said air circulating means for moving said cam into position to lock said shutters in their open position and permit the discharge of air from said duct.

15. An air circulating device including a duct, means for circulating air through said duct, means including a plurality of shutters for closing said duct, means including a cam for locking said shutters in their closed position and for locking said shutters in their opening position, gravity actuated means for holding said cam in position

to lock said shutters in their closed position, means including an opening in said duct and a plate arranged to cover said opening and actuated by the static head produced by said air circulating means when said shutters are closed for unlocking said shutters to permit opening thereof, means actuated by the velocity head produced by said air circulating means for moving said cam into position to lock said shutters in their open position and permit the discharge of air from said duct, and means including a plate for closing said opening in said duct when said shutters are in their open position.

KENTON D. McMAHAN. 15

CERTIFICATE OF CORRECTION.

Patent No. 2,141,923.

December 27, 1938.

KENTON D. McMAHAN.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 4, first column, line 14, claim 15, for the word "opening" read open; and that the said Letters Patent should be read with this correction therein that the same may conform to the records of the case in the Patent Office.

Signed and sealed this 7th day of March, A.D. 1939.

Henry Van Arsdale.

(Seal)

Acting Commissioner of Patents.