

July 12, 1960

O. E. EISSMANN

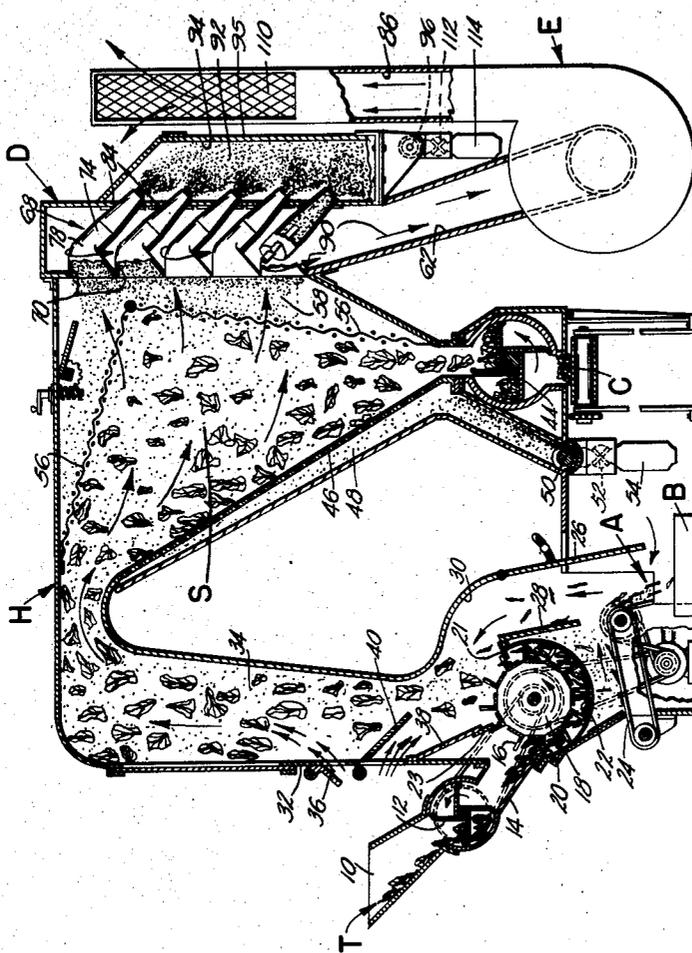
2,944,629

TOBACCO SEPARATING APPARATUS

Filed Aug. 9, 1957

2 Sheets-Sheet 1

FIG. 1



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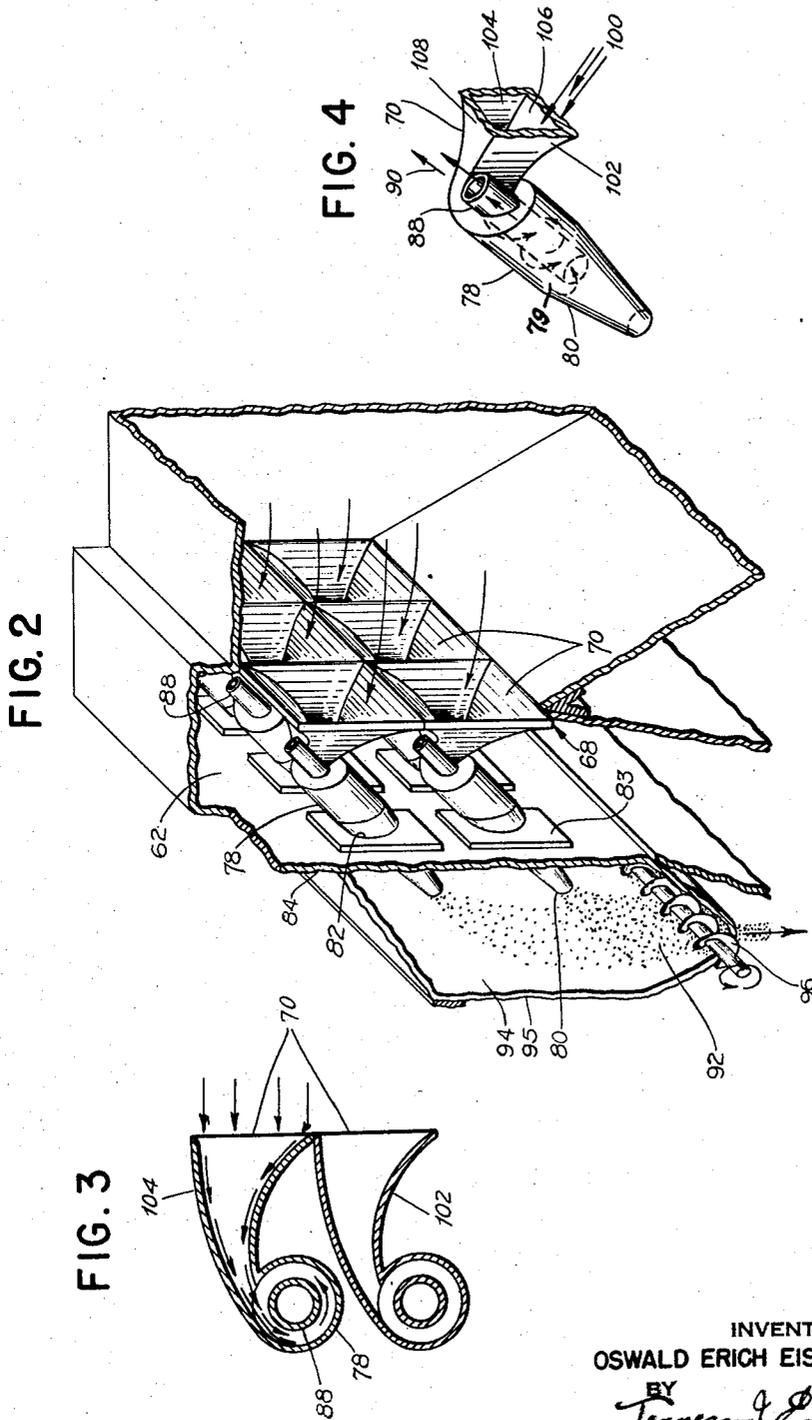
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TOBACCO SEPARATING APPARATUS

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Filed Aug. 9, 1957, Ser. No. 677,314

9 Claims. (Cl. 183—34)

This invention relates to an improved tobacco and dust separating method and apparatus.

Heretofore, dust filter assemblies used in tobacco separating machines have not operated at peak efficiency due to the necessity for employing walls to support the ducts. The portion of the wall between the intake ducts caused zones of turbulence in front of these areas. These turbulent zones were objectionable because they caused pressure drops at these points. They also caused excessive wear of the ducts, and there was an unnecessary accumulation of rebounding dust at the entrance chamber. In addition, there was an objectionable intake noise inherent in this design.

It is therefore an object of my invention to provide a separator having a filter which will eliminate these zones of turbulence.

A further object is to arrange the intake ducts so that they form one side of the separating chamber.

A further object is to provide means for equally distributing the dust-laden airstream uniformly over all the individual cyclone separator inlet ducts, to thereby eliminate air pockets and turbulence which previously resulted in dust accumulating and settling downwardly in front of the inlet ducts.

Another object of this invention is to eliminate the necessity of employing means formerly required for removing dust settling downwardly in front of the inlets to the cyclone separators.

Other objects and features of this invention will appear as the description of the particular physical embodiment selected to illustrate the invention progresses. In the accompanying drawings, which form a part of this specification, like characters of reference have been applied to corresponding parts throughout the several views which make up the drawings.

In the accompanying drawings

Figure 1 is a sectional side elevation of the improved tobacco and dust separating apparatus.

Figure 2 is a perspective sectional view of an example of the improved dust separating apparatus.

Figure 3 is a vertical sectional side view of two improved cyclone dust separators contiguously joined at their respective intake tapered ducts.

Figure 4 is a perspective view of a single cyclone dust separator.

To illustrate my invention, I have shown how it can be employed in combination with a tobacco separating apparatus such as that shown in my prior Patent 2,755,930, granted July 24, 1956.

In the embodiment shown in Fig. 1, the tobacco and dust separating apparatus consists of a tobacco separator housing H, a detachable dust separator unit D, and a suitable source of suction E.

In operation, the unstemmed tobacco leaves T are deposited into an inclined feed chute 10 which delivers them into the pockets of a revolving gate valve 12. The latter, by means of another inclined chute 14, feeds said tobacco into the path of suitable combs 16 secured to a revol-

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ving drum 18. Combs 16, coacting with stationary rakes 20, 21 and 23 and a plurality of spaced semicircular serrated bars 22 surrounding said drum, cause the lamina to be torn from the stem portion of the leaves in a manner shown and described in my prior United States Patent 2,701,570, granted February 8, 1955.

Tearing of the lamina from the stem takes place when the combs 16 first engage with the tobacco leaves. Additional tearing takes place when the leaves are forwarded past stationary rakes 20, 21 and 23 and serrated bars 22.

The torn tobacco and stem portion drop through the spaces between the serrated bars 22 onto a continuously moving belt 24 which hurls the torn tobacco and stem pieces toward an adjustable wall 26 into the air stream entering the separating apparatus at location A. The air stream is created by the suction system E and torn tobacco is carried through the separating housing H by the air stream in the direction of the arrows shown in Fig. 1.

The stem portions which have been stripped clean of leaf lamina, of course, are more compact than the lamina and therefore offer less resistance to the lifting action of the incoming air stream. As a result, the stems drop through said opening of the housing into a suitable box or receptacle B. The pieces of lamina and the stem portions which still have some lamina adhering thereto after being thrown off the belt 24 are intercepted by the incoming air stream and carried upward between the adjustable wall 26 and an air stream guide plate 28 in the direction of the arrows.

The guide plate 28 serves the important purpose of retaining the velocity of the air stream and preventing the stems with adhering tobacco from being pushed by the air stream back into the space between the serrated bars 22 and belt 24.

It has been found that without guide plate 28 the velocity of the air stream, entering from a substantially narrower opening, decreases because of the larger space between the bars 22 and belt 24 to such an extent that the stems with adhering tobacco tumble downward again and fall out of the air stream back onto the belt and the tobacco carried thereon. Such movement created a turbulence and started to entangle the tumbling tobacco with the newly arriving tobacco which resulted in a rolling action of the entire mass.

During this rolling action, the stem portions engaged with a certain amount of free lamina and created a lump or ball similar to a snowball rolling down a hillside. After this lump became too big and heavy for the air stream to support and roll, it simply dropped out of the opening of the incoming air and even sometimes choked the machine.

I have found that I have overcome this difficulty by adding guide plate 28 and the stems with adhering tobacco are carried upward and are deflected back by the deflector wall 30 into the range of action of the shredding drum 18 to be reprocessed. It will thus be seen that only clean individual stems fall out of the opening A into the chute or receptacle B.

All lamina including that hurled by centrifugal force from the shredding drum 18 travels upward and around the horizontal bend 30 of the separator housing H. Incompletely stemmed tobacco is deflected back to the thresher in the manner described and claimed in my prior United States Patent 2,701,570, granted February 8, 1955. The vertical forward wall 32 of vertical shaft 34 of said housing H is provided with an air inlet door 36 which opens up outwardly and permits a predetermined amount of air to enter into the separating chamber at this point. Door 36 is made of three sections and is shown and described in my United States Patent 2,643,768 granted June 30, 1953. This door is provided for

the purpose of controlling the amount of air in the vertical shaft of the separator housing H. I have found that while it serves the purpose for which it was intended the incoming air stream traveling in substantially the same direction as the original one, often reinforced the latter stream to such an extent that it lifted up everything in its upward straight path including undesirable light weight stems.

To eliminate this undesirable action and to avoid the occasional objectionable accumulation of tobacco on the top surface of the stationary air stream guide plate 38, another three sectional door 40 is provided. The latter is of substantially the same design as the doors 36, but doors 40 open inwardly and cause the incoming air stream to move downwardly and somewhat intercepting the up coming air stream and at the same time offsetting the air stream entering through doors 36. It is very noticeable that this combination or action of the intercepting air streams results in a very desirable turbulence with the effect of spreading the tobacco in the separator housing over a much greater area and causing torn tobacco leaves to bounce in a criss-cross, back and forth, and up and down manner thereby resulting in a greater quantity of cleaner finished tobacco as well as a marked increase in separating efficiency.

The pieces of lamina thus cleaned float upward and into the rear chambers of the separator housing H provided at its lower most portion with a suitable rotating gate valve 44 which may be of substantially the same design and construction as the one shown in my prior United States Patents 2,701,570, granted February 8, 1955, and United States 2,755,930, granted July 24, 1956, and which deposits the cleaned lamina onto a suitable conveyor C. The rear chamber of the separator housing H is also provided with an inclined perforated plate 46 which permits any sand or heavy dust particles to drop through the perforations of said plate into a suitable chute 48 which leads to a suitable screw conveyor 50. The accumulated material is forwarded to a suitable gate valve 52 which discharges the material into a collector or receptacle 54. The rear portion of said rear chamber is also provided with a suitable screen 56 through which the dust laden air is exhausted and which separates lint, string and feathers from the air stream in this area.

When the dust and leaf laden air stream enters the settling chamber S, it is very desirable that turbulence be kept at a minimum. My invention enables this objective to be attained by positioning all of the intake ducts of my dust separator across the entire air flow area which was formerly either completely or partially enclosed by a wall surface which resulted in undesirable turbulence and noises at this area.

Additional mechanism was also required in the type of separation apparatus formerly employed for the collection and removal of dust, sliding down the surface of a duct support wall. The dust collection and removal formerly required, consisting of a screw conveyor, a gate valve and a dust receptacle, is no longer necessary with my present apparatus. Its elimination is due to the fact that dust cannot escape from the suction airstream, as heretofore, by rebounding from the duct supporting wall surface or by virtue of air pockets, since there is neither wall surface nor air pockets.

The dust laden air 58, passing out of the settling chamber S and drawn toward a cleansed air suction shaft 62, passes through the screen 56. The dusty air then passes into the lower pressure zone on the downstream side of the screen 56 and into the bank 68 of contiguously joined outwardly flared intake ducts 70. These ducts are contiguously joined and sealed at their common points of extreme flare in such a fashion as to form a bank 68 of contiguous ducts 70 receiving their support only from each other and not from any other supporting member thereby avoiding the necessity for any wall area.

This dust separator duct bank 68 is securely fastened and its edges sealed within the housing D and effectively

confines the incoming dust laden air 58, offering it no alternative but to enter into the several dust separator ducts 70.

The screen 56 prevents any leaves, lint or feathers from entering the intake ducts 70, and diffuses the air uniformly among all the ducts 70.

In order to eliminate the turbulence and objectionable noise that resulted from the use of wall areas transverse to the air stream, and to improve efficiency by using the force of the entire air flow, I have made the cross-section of each duct rectangular. Each duct entrance being rectangular, when contiguously joined to each other to form a bank of ducts, the perimeter of said bank is therefore rectangular. I have designed the contaminated air and leaf settling chamber S to fit securely to the perimeter of the duct bank 68, thereby eliminating the need for a supporting wall transverse to the air stream.

Each dust separator 74 within said dust separator duct bank 68 has an inlet duct 70 for dust air. Said inlet duct 70 is connected to and blends in with the top end of a cylindrical housing 78 of a cyclone dust separator 74 in a tangential and spiral fashion, as illustrated in Figures 2 and 4.

All the cyclone dust separator units 74 are surrounded and supported at their girth at or near their midpoints by flanged openings 82, flanges 83 reinforcing the openings, in a wall 84 common to all ducts, said flanged wall 84 separating the dust collecting chamber 94 from the filtered air suction shaft 62. The cyclone housing 78, on its lower end, is provided with a conical portion 80. Into the top portion of the cyclone housing 78 protrudes a tube 88 held in a suitable manner in the center of and coaxial with the housing 78, whereby an annular chamber 79 is formed between housing 78 and tube 88.

As the dust laden air 58 enters into the tangential inlet duct of each separator 78, it is caused to spin around within the housing 78 in the annular space formed by its outer wall and tube 88.

Clean air is drawn out through clean air tube 88 in the direction of arrows 90 through the center of the housing 78. Since the dusty air has the tendency to reach the bottom of the intake tube 88 in the shortest possible route, the highest concentration of dust air is forced to travel with the arrows 100 following the spiralling interior of the duct 70.

The convex configuration of the inner side walls 102 prevents highly concentrated dust laden air from traversing the spiral interior of the housing 78 and the subsequent rebounding from its opposing outer duct wall 104. Instead, the convex shape guides the dust air into tangential contact with the interior of the cyclone housing 78, thereby supporting an undisturbed tangential flow of the dust air resulting in greater cyclonic efficiency.

The duct bottom 106 and the duct ceiling 108 may assume any form yielding the desired acceleration. This spinning action creates a centrifugal force separating the dust from the air, the dust being heavier, is thrown out of the open end of the conical portion 80 of said cyclone housing 78. The clean air 90 is exhausted from said cyclone housing 78 through the tube 88 into the clean air suction shaft 62. Clean air exhaust shaft 86 is suitably connected to suction shaft 62 by one or more suction fans E, as can be seen in Fig. 1, which through a suitable exhaust port 110, discharge the clean air 90 into the atmosphere from which it originated.

The dust 92 discharged from the open end of the conical portion 80 of each cyclone separator 74, falls into the dust collecting chamber 94. A suitable screw conveyor 96 is mounted at the lower portion of the dust collecting chamber 94 to continuously remove the dust into a gate valve 112 from which the dust falls into a suitable receptacle 114.

The invention described above may be varied in construction within the scope of the claims herein, and is not to be restricted to the precise details of the structure shown and described.

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What is claimed is:

1. A separating apparatus for a tobacco processing machine comprising means for centrifugally separating foreign particles from a contaminated air stream, annular chambers formed in said separating means, ducts having intake openings for guiding the contaminated air stream into the annular chambers of said separating means, the inner surface of each of said ducts defining a smooth-walled uninterrupted channel having an open cross-section from the intake opening thereof throughout the annular chamber, the intake opening of said ducts being at an angle to said annular chamber, the surface area of the intake opening of said ducts having an outwardly flared form, all ducts being contiguously joined with each other at their extreme points of flare along all adjacent rim sections forming a bank and receiving their support from each other, said duct bank being vertically positioned across the total area of active entrance of the contaminated air stream, and support means for said separating means, said support means supporting said separating means in a region substantially removed from the intake openings of said ducts.

2. A separating apparatus for a tobacco processing machine comprising means for centrifugally separating foreign particles from a contaminated air stream, annular chambers formed in said separating means, and ducts having intake openings for guiding the contaminated air stream into the annular chambers of said separating means, the inner surface of each of said ducts defining a smooth-walled uninterrupted channel having an open cross-section from the intake opening thereof throughout the annular chamber, each of said ducts being formed at its intake opening with a narrow rim of substantially straight sections, the intake opening of said ducts being at an angle to said annular chamber, the surface area of the intake opening of said ducts having an outwardly flared form, all ducts being contiguously joined with each other at their points of maximum flare along all adjacent rim sections forming a bank and receiving their support from each other, said duct bank being positioned transversely across the entire contaminated air stream, thereby avoiding the use of any wall area transverse to said air stream.

3. A separating apparatus for a tobacco processing machine comprising in combination, a bank of cyclone separators having outwardly flared ducts contiguously joined to each other at the points of extreme flare along all adjacent rim sections, each duct having an intake opening opposing the flow of a contaminated air stream and being connected at its downstream portion with its own cyclone dust separator, each of said ducts being formed at its intake opening with a narrow rim of substantially straight sections, the inner surface of each of said ducts defining a smooth-walled uninterrupted channel having an open cross-section from the intake opening thereof throughout its separator, the intake opening of said ducts being at an angle to said dust separator, the adjoining walls of each duct being joined so that one wall has a greater incline to the air stream than the adjoining duct wall, means for causing the stream of contaminated air to flow through said bank of outwardly flared ducts.

4. A separating apparatus comprising in combination, a bank of cyclone separators having outwardly flared ducts contiguously joined to each other at the points of extreme flare along all adjacent rim sections, the adjoining walls of contiguously joined ducts having angles of inclination which differ from each other so as to cause more air to flow past one wall than the wall of the contiguous duct to prevent the accumulation of material at the point of joiner of the duct walls, said duct bank having intake openings positioned transversely across a contaminated air-flow so as to trap and guide all the contaminated air in the air stream into said cyclone dust separators, each of said ducts being formed at its intake opening with a narrow rim or substantially straight sections, the inner sur-

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face of each of said ducts defining a smooth-walled uninterrupted channel having an open cross-section from the intake opening thereof throughout its separator, the intake opening of said ducts being at an angle to said cyclone separators, and a meshed screen to diffuse a high concentrated pressure zone on the upstream side of the screen into a diffused pressure zone on the downstream side of the screen, thereby equally charging the several dust separator ducts in the duct bank.

5. A separating apparatus for a tobacco processing machine comprising in combination a bank of cyclone separators having outwardly flared ducts contiguously joined to each other at their points of extreme flare along all adjacent rim sections to form a bank, said ducts having intake openings, each of said ducts being formed at its intake opening with a narrow rim of substantially straight sections, the inner surface of each of said ducts defining a smooth-walled uninterrupted channel having an open cross-section from the intake opening thereof throughout its separator, the intake opening of said ducts being at an angle to said outlets said bank being placed vertically across the entire active entrance area of a contaminated air stream, the ducts being flared to decrease resistance and noise and having the contiguous walls of adjoining ducts having different degrees of incline with respect to the air stream so as to cause more air to move past one wall than the other so as to prevent material from building up at said joiner.

6. A separating apparatus for a tobacco processing machine comprising in combination a transverse bank of cyclone separators having outwardly flared ducts contiguously joined to each other at the points of extreme flare along all adjacent rim sections, each of said ducts being formed at its intake opening with a narrow rim of substantially straight sections, the inner surface of each of said ducts defining a smooth-walled uninterrupted channel having an open cross-section from the intake opening thereof throughout its separator, the intake of said ducts being at an angle to the outlet the adjoining walls of adjacent ducts being constructed and arranged so that one wall will have a steeper incline than the adjoining wall to prevent particles from straddling and building up on said joined walls, said ducts being flared to avoid the angular attack of high speed abrasive dust particles on the flared surface of the duct.

7. A separating apparatus for a tobacco processing machine comprising an air passageway, means for moving a stream of contaminated air through said passageway, a bank of cyclone separators positioned vertically in front of the air stream, said separators having outwardly flared intake ducts contiguously joined together at their extreme outward flared edges along all adjacent rim sections to form a wall to wall surface of intake ducts across the contaminated air stream, each of said ducts being formed at its intake opening with a narrow rim of substantially straight sections, the inner surface of each of said ducts defining a smooth-walled uninterrupted channel having an open cross-section from the intake opening thereof throughout its separator, the intake opening of said ducts being at an angle to said outlet, the surface of adjacent contiguously joined ducts having different angles of inclination with respect to the air stream to cause a proportionately larger amount of air to flow past one surface than the adjoining surface to prevent material from straddling and piling up on said adjacent surfaces, and a diffuser interposed across the contaminated air stream at a point upstream from said intake ducts to cause a uniform amount of air to enter each of said intake ducts.

8. A separating apparatus comprising a housing, an air passageway formed in said housing, a tobacco separator chamber interposed in said passageway for separating torn tobacco leaves from said air stream, a bank of cyclone separators, said cyclone separators having outwardly flared ducts contiguously joined to each other along all adjacent rim sections and vertically interposed

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across the entire cross sectional area of said air stream so as to avoid having any transverse wall area interposed in said air stream between said intake ducts to avoid turbulating the air stream at this point, each of said ducts being formed at its intake opening with a narrow rim of substantially straight sections, the inner surface of each of said ducts defining a smooth-walled uninterrupted channel having an open cross-section from the intake opening thereof throughout its separator, the intakes of said ducts being at an angle to said outlets, the adjoining contiguously joined ducts having walls with different angles of inclination with respect to the air stream to prevent material from accumulating thereon.

9. A separating apparatus comprising tobacco separator housing, a passageway formed in said housing, a source of torn tobacco leaves, means for delivering said torn tobacco leaves to said air passageway, means for causing a stream of air to flow through said air passageway, a settling area formed in said passageway to first remove tobacco stems, a second settling area for removing torn tobacco leaf lamina, a bank of small diameter cyclone separators for separating dust from an air stream, said separators having outlets and intake ducts that are contiguously joined with each other along all adjacent rim sections to avoid having a wall surface between the ducts, each of said ducts being formed at its intake opening with a narrow rim of substantially straight sections, the

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adjoining surfaces of contiguously joined ducts having different angles of inclination to prevent material from accumulating on said surfaces, the cross sectional area of said contiguously joined intake ducts being coextensive with the cross sectional area of said air passageway in which it is interposed to avoid having any transverse wall area interposed in the path of said air stream, the inner surface of each of said ducts defining a smooth-walled uninterrupted channel having an open cross-section from the intake opening thereof throughout its separator, the intakes of said ducts being at an angle to said outlets.

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