Dec. 4, 1962 E. J. KASPER 3,066,345

BLACKBOARD ERASER CLEANER

Filed July 17, 1961 5 Sheets-Sheet 1

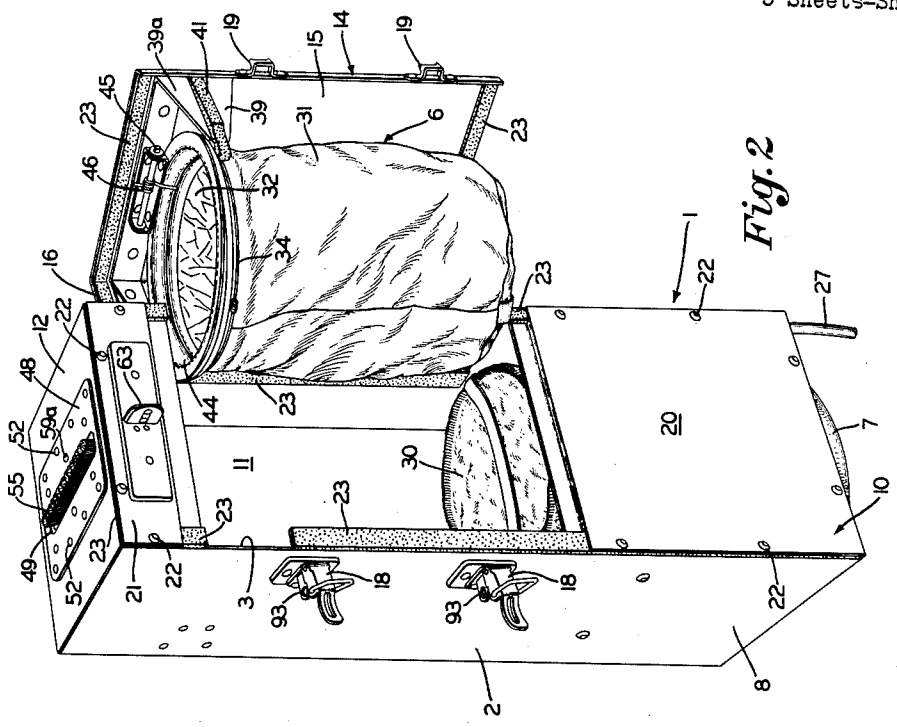


Fig. 2

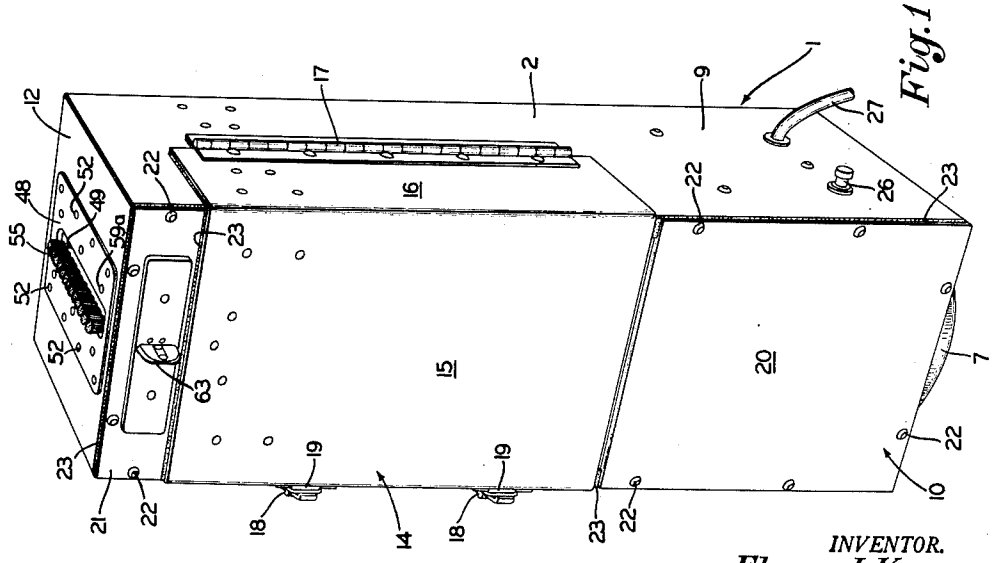


Fig. 1

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BLACKBOARD ERASER CLEANER

Filed July 17, 1961 5 Sheets-Sheet 2

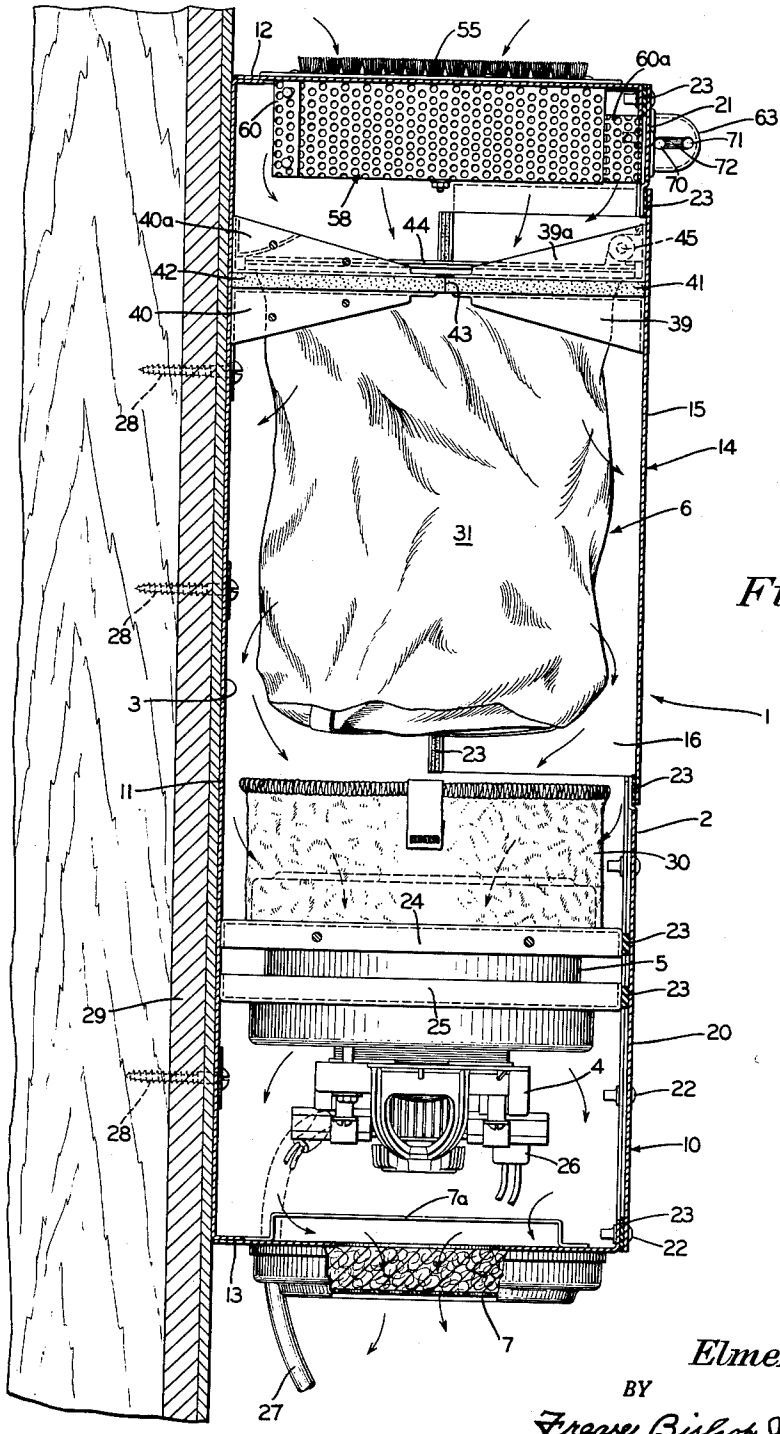


Fig. 3

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BLACKBOARD ERASER CLEANER

Filed July 17, 1961 5 Sheets-Sheet 3

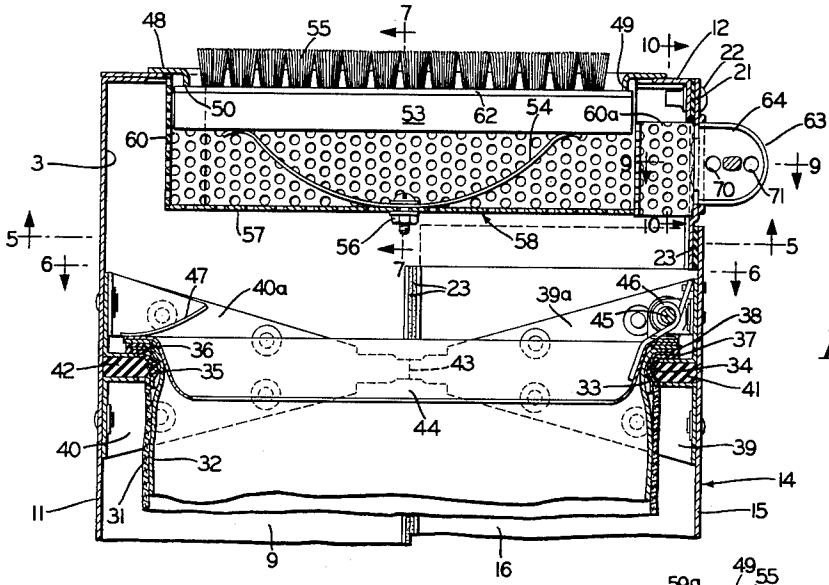


Fig. 4

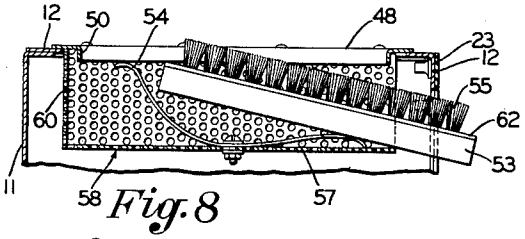


Fig. 8

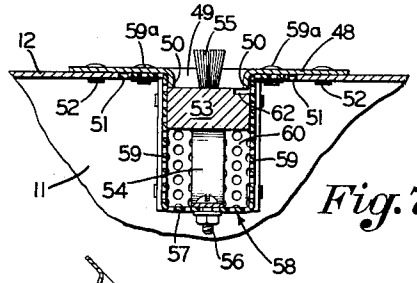


Fig. 7

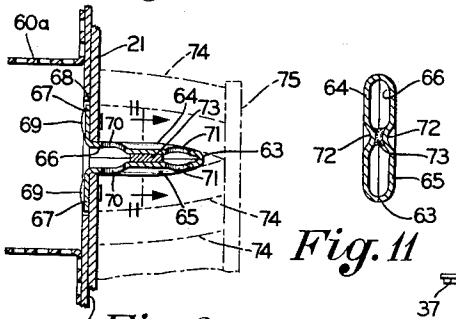


Fig. 11

Fig. 9

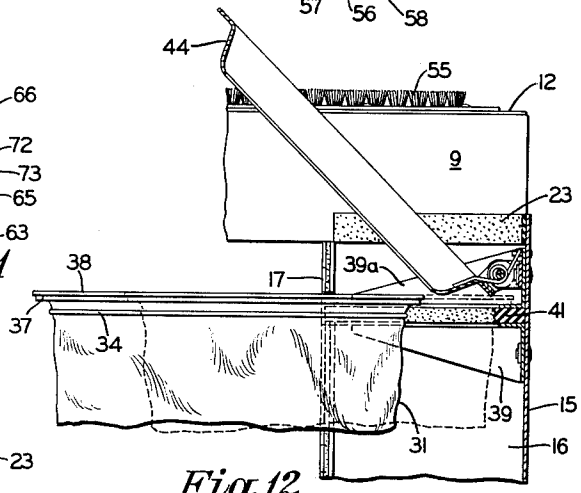


Fig. 12

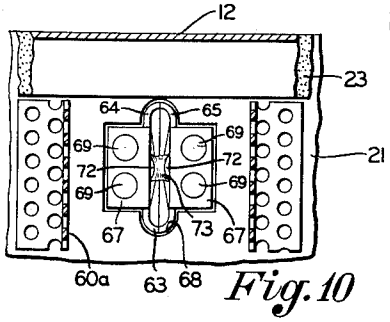


Fig. 10

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BLACKBOARD ERASER CLEANER

Filed July 17, 1961 5 Sheets-Sheet 4

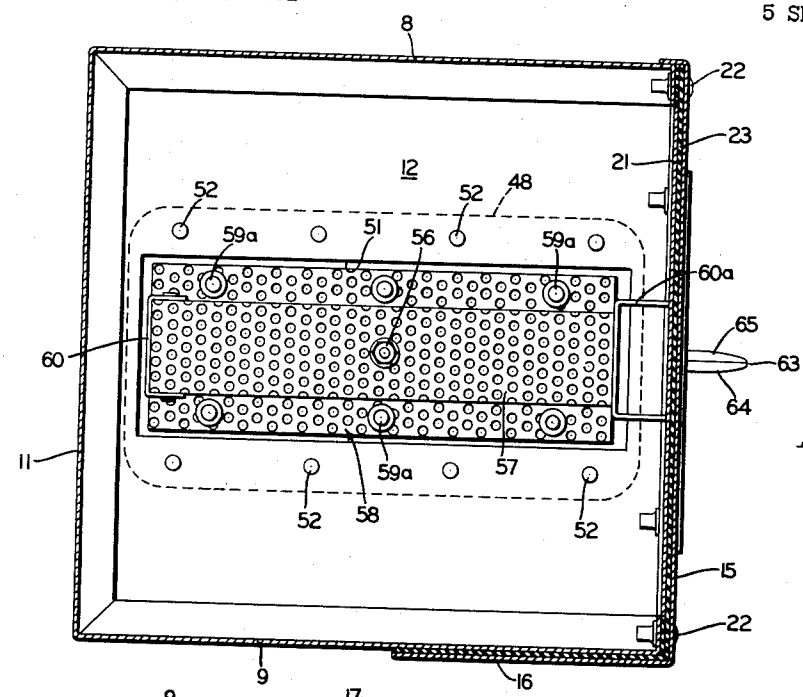


Fig. 5

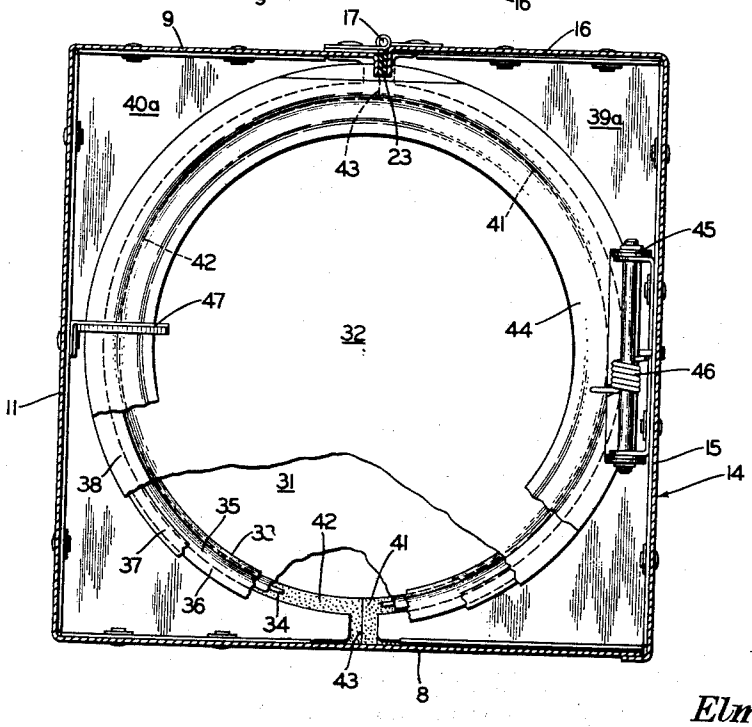


Fig. 6

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BLACKBOARD ERASER CLEANER

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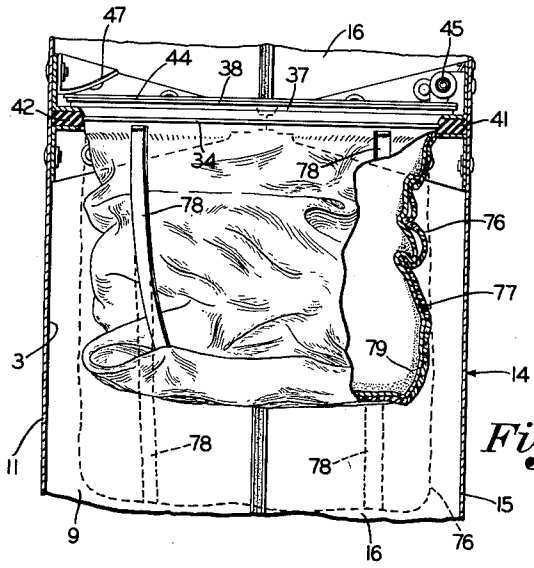


Fig. 13

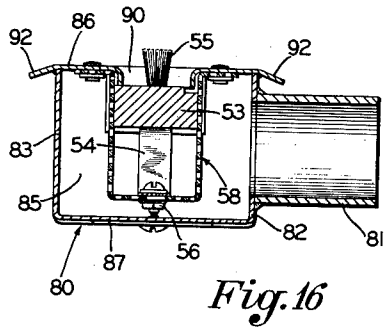


Fig. 16

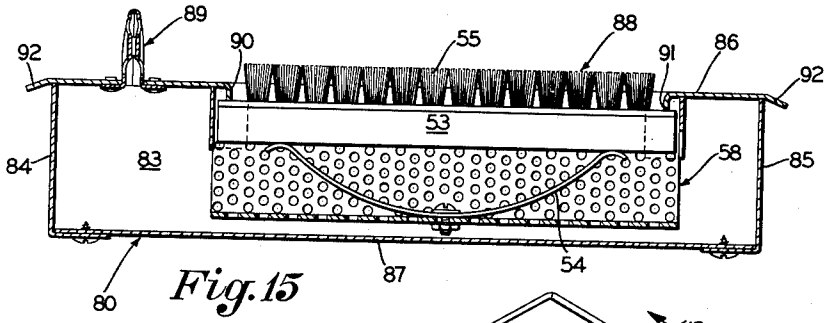


Fig. 15

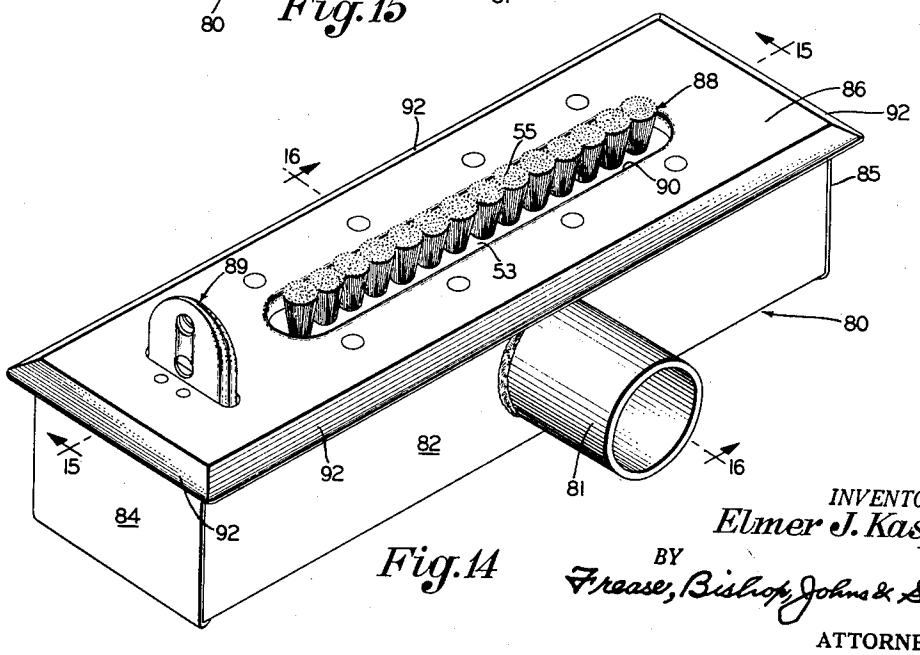


Fig. 14

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United States Patent Office 3,066,345
Patented Dec. 4, 1962

3,066,345

BLACKBOARD ERASER CLEANER

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Filed July 17, 1961, Ser. No. 124,605
4 Claims. (Cl. 15—310)

This invention relates to a blackboard eraser cleaner and more particularly it pertains to a suction cleaner means for removing dust from blackboard erasers.

Blackboard eraser cleaners of various types have been known. One type has included a rotating agitating brush which has been inadequate for a number of reasons. In the first place, the rotating brush is necessarily located in air suction brush cleaning inlet. Due to clearance around the brush in the inlet, air leakage reduces the effective suction on the surface of the eraser. In the second place, the use of a rotating brush for cleaning an eraser composed of layers or laminations of felt is undesirable because of undue wear to the eraser felts by the brush action.

One reason for providing a suction cleaner having a more effective suction is to eliminate flying chalk dust particles and thus remove a health hazard that existed when using old-fashioned cleaning methods. By providing a blackboard eraser cleaner having a more effective suction applicable to the surface of the eraser, all chalk particles are collected in the cleaner for subsequent disposal in a detachable filter bag. In that manner the task of cleaning erasers is performed effectively in a shorter period of time.

Heretofore eraser cleaners have been used mostly for cleaning the exposed surfaces of the eraser felts without providing for removal of chalk dust from the interstices between the layers of felt. After repeated usage and inadequate cleaning, the interstices become saturated with accumulated chalk dust, resulting in an inadequate erasing job.

The device of the present invention provides an eraser cleaner having an air inlet opening at one end in which is mounted a non-rotating strip brush for the purpose of agitating dust from the surfaces of the eraser felts or laminations, which brush in combination with a more effective suction, results in a highly effective cleaner for blackboard erasers. In addition, the device provides an insert having openings on opposite sides through which air is drawn for insertion and cleaning between layers of felts.

The device of the present invention also provides an insert for insertion between the felt laminations for removal of dust in a manner which has not been previously provided. Thus an eraser may be cleaned externally and internally completely of chalk dust particles and thereby not only perform a better cleaning job but also have a prolonged life.

The cleaner is provided with a removable paper filter bag which is mounted on an access door on the housing of the cleaner. Both the bag and the door are mounted in airtight sealing means to minimize air leakage as well as to provide a maximum of air suction at the eraser cleaning opening. The cleaner is also provided with a second stage cloth bag for supporting the removable paper bag, as well as a third stage nylon waste cap filter as a dust protector for the motor. Finally, the cleaner is provided with an air exhaust filter preferably composed of spun glass that not only helps to eliminate any possible dust from the air as it leaves the cleaner but also minimizes the exit noise of the air.

Accordingly, it is an object of this invention to provide a blackboard eraser cleaner which is highly effective in

removing chalk dust particles from the cleaning surface of an eraser by the combined use of greater air suction and a substantially stationary agitation brush.

It is another object of this invention to provide a blackboard eraser cleaner having an insert for cleaning chalk dust from the crevices or interstices between the eraser felts or laminations.

It is another object of this invention to provide a blackboard eraser cleaner having spaced means for cleaning the rubbing surface of an eraser as well as the crevices between the eraser felts, which means may be used separately for performing their respective operations.

Finally, it is an object of this invention to provide an eraser cleaner which is highly effective for the purpose of cleaning erasers and for easy maintenance by collecting chalk dust particles in a detechable dust bag.

These and other objects and advantages apparent to those skilled in the art from the following description and claims may be attained, the stated results achieved and the described difficulties overcome by the discoveries, principles, apparatus, parts, combinations, subcombinations and elements which comprise the present invention, the nature of which is set forth in the foregoing statements, preferred embodiments of which—illustrative of the best modes in which applicant has contemplated applying the principles—are set forth in the following description, and which are particularly and distinctly pointed out and set forth in the appended claims forming part hereof.

The blackboard eraser cleaner of the present invention may be stated in general terms as including walls forming a preferably vertical tubular housing having upper and lower end closures, the upper closure being provided with an elongated air suction inlet, the lower closure being provided with an air outlet, a power-driven, suction-creating fan within the housing near the lower closure, filter bag means mounted between the upper closure and the fan, a strip brush in the air suction opening yieldably mounted for agitating the surface of an eraser when an eraser is moved over the air suction inlet, a crevice insert mounted on and extending outwardly from the housing and preferably spaced from the air inlet opening and above the filter bag, the insert having air inlet openings which communicate with the interior of the housing, and the filter bag means being detachably mounted on an access door on the housing.

The preferred embodiments of the invention are illustrated by way of example in the accompanying drawings wherein:

FIGURE 1 is a perspective view of the blackboard eraser cleaner with the access door closed;

FIG. 2 is a perspective view of the blackboard eraser cleaner with the access door open and showing the filter bag mounted on the inner surface of the door;

FIG. 3 is a vertical sectional view through the cleaner showing the relationship of the several parts with respect to each other;

FIG. 4 is an enlarged fragmentary vertical sectional view of the upper end of the cleaner;

FIG. 5 is a bottom plan view of the cleaner top closure showing the manner in which the cage for a strip brush is mounted in place, taken on the line 5—5 of FIG. 4;

FIG. 6 is a horizontal sectional view with parts broken away to show their construction, taken on the line 6—6 of FIG. 4;

FIG. 7 is a vertical sectional view taken on the line 7—7 of FIG. 4;

FIG. 8 is a fragmentary vertical sectional view showing the manner in which the strip brush may be inserted and removed from position;

FIG. 9 is a horizontal sectional view taken on the line 9—9 of FIG. 4, and showing an eraser (in broken line) mounted over the insert for cleaning between the eraser felts;

FIG. 10 is a horizontal sectional view taken on the line 10—10 of FIG. 4;

FIG. 11 is a vertical sectional view taken on the line 11—11 of FIG. 9;

FIG. 12 is an enlarged fragmentary vertical sectional view through the door which is open and against the outer wall of the cleaner, showing the manner in which the bag means is detachably mounted in place and showing in broken line the position of the bag means when in use position;

FIG. 13 is a fragmentary vertical sectional view through the cleaner showing an alternate form of bag means;

FIG. 14 is a perspective view of an alternate form of a blackboard eraser cleaner which may be attached to the end of a hose of a conventional tank-type suction cleaner;

FIG. 15 is a vertical sectional view taken on the line 15—15 of FIG. 14; and

FIG. 16 is a vertical sectional view taken on the line 16—16 of FIG. 14.

Similar numerals refer to similar parts throughout the several views of the drawings.

In FIG. 1 a blackboard eraser cleaner is generally indicated at **1**. It includes an outer casing or housing **2** which is preferably composed of sheet metal walls forming an inner compartment **3**. As shown in FIG. 3, the cleaner **1** also includes a motor **4**, a suction fan **5**, and air filter bag means **6** above the fan. Air enters the upper end of the housing **2**, passes from the bag means **6** and through the fan **5** and exits from the housing compartment **3** through an air outlet means **7** at the lower end of the housing after flowing around a noise-reducing air baffle **7***a* above the means **7**.

The housing **2** is preferably rectangular in shape and includes opposite side walls **8** and **9**, a front wall **10**, a rear wall **11**, as well as upper and lower end walls **12** and **13**, all of which are shown in FIGS. 1–3. In addition, the housing **2** includes an access door **14** having a front panel **15** and a side panel **16**, the latter of which is provided with a hinge **17** by which the door is mounted on the side wall **9**, as shown in FIG. 1. On side wall **8** a pair of clamps **18** are mounted, which clamps engage clamp hooks **19** on the door **14** for holding the door closed in an airtight manner. As shown in FIG. 1, the front panel **15** of the door, as well as a panel **20** below the panel **15**, constitute the major portion of the front wall **10** of the cleaner. Access to the inner parts of the cleaner may be had by removing the panels **20** and **21** and by opening the door **14**. The upper end portion of the front wall **10** includes a panel **21** above the panel **15** of the door. The panels **20** and **21** are detachably mounted in place by similar screws **22** and, like the door **14**, are secured against the adjacent side walls **8** and **9** in an airtight manner by gasket strips **23** which are provided at appropriate locations between the edges and ends of the panels **20** and **21** and the door **14** for sealing out air from the atmosphere and thereby increasing the effectiveness of air entering the cleaner through the upper end in a manner to be described below.

As shown in FIG. 3, the motor-fan unit which includes the motor **4** and the fan **5**, is mounted in the lower portion of the compartment **3** by a pair of spaced partitions **24** and **25** which are secured to the inner surfaces of the walls **8–11** in an airtight manner. The motor-fan unit is of conventional construction and an off-on switch **26** (FIG. 1) is provided on the side wall **9** for the motor. An electric cord **27** is also provided in a conventional manner. As shown in FIG. 3, the cleaner **1** is preferably mounted by spaced screws **28** on a wall **29** at a convenient height from a floor for placement of blackboard erasers on the upper end wall **12** of the cleaner. As shown in FIG. 3, a third stage filter **30**, which is composed of air-

pervious material such as nylon waste, is placed above the entry end of the fan **5**. The filter **30** serves as an additional filter means for preventing any possible chalk dust which escapes the filter bag means **6** from entering the fan and motor unit.

The filter bag means **6** is disposed in the upper portion of the compartment **3** where it is detachably mounted on the inner surface of the door **14**. The filter means **6** includes an outer cloth bag **31** and an inner paper filter bag **32** which serves as a disposable liner for the cloth bag. As shown in FIGS. 2, 3, 4, and 6, the filter bag **31** includes an outturned metal ring **33** to which the upper end of the cloth bag is secured by a tightly fitting wire **34**. For that purpose the metal ring **33** has an inturned groove **35** in which the cloth bag **31** is held by the ring **33**. In addition, the ring includes an outturned flange **36** which is enclosed in a gasket ring **37** having a U-shaped cross section and seated on the outer edge of the flange.

Likewise, the upper end of the paper bag **32** is provided with a reinforcing ring **38** preferably composed of paperboard to which the bag **32** is attached by stitching. When the bags **31** and **32** are assembled, the ring **38** is disposed above the gasket ring **37** on the flange **36** (FIG. 6).

Within the compartment the bag means **6** is mounted on and between a pair of semicircular bag retainer brackets **39** and **40**, the former bracket **39** being mounted on the inner surface of the door **14** and the latter bracket **40** being mounted on the inner surface of the rear wall **11**. The bracket **39** is composed of two portions (FIGS. 2 and 3) including an upper portion **39***a* which is spaced from the bracket **39** by a distance equal to the thickness of an air gasket **41** having a semicircular inner configuration abuttable with the upper end portion of the cloth bag **31**.

Likewise, the retainer bracket **40** includes an upper bracket member **40***a* secured to and between the side walls **8** and **9** and rear wall **11** and spaced from the bracket **40** by a distance equal to the thickness of an air gasket **42**. The gasket **42**, like the gasket **41**, includes an inner semicircular surface which abuts the upper end portion of the filter bag **31**. As shown in FIG. 6, the gaskets **41** and **42** have similar abutting ends **43** and when the door **14** is closed, hold the bag means **6** tightly in place with the semicircular gaskets **41** and **42** forming an airtight seal so that air passing downwardly from the upper end of the housing passes completely into the bag means **6** where it deposits chalk dust particles.

When the door **14** is open the bag means **6** is retained in position on the brackets **39** and **39***a* by a retaining ring **44** which is hingedly mounted on the inner surface of the door by a hinge **45** which is spring-biased downwardly by a wire spring **46** for holding the ring **44** tightly against reinforcing ring **38** and flange **36**. Thus the ring **44** clamps one half of said flange and ring in place within the inside radius of the gaskets **41** and **42**. When the door is closed the ring **44** also holds the other half of the upper end of the bag tightly against the gasket **42**, as shown in FIGS. 6 and 13. For that purpose, a ring camming bracket **47** (FIG. 4) is mounted on the rear wall **11** above the bracket **40***a* so that as the door is closed the ring **44**, the flange **36**, and the ring **38** are clamped tightly in place.

As shown in FIGS. 2 and 12, the retaining ring **44** is movable between the clamping position of FIG. 2 and the open position of FIG. 12.

Moreover, although the filter bag means **6** is detachably mounted on the access door **14**, it may be mounted within the cleaner housing in a manner similar to that by which it is mounted on the door without departing from the invention.

The means for cleaning erasers is provided in the upper end portion of the cleaner **1**. As shown in FIGS. 1, 3, and 4, the upper end wall **12** is provided with a skid plate **48** having an elongated opening **49**, which opening is formed by a downturned flange **50** extending around

the opening. The flange 50 extends into a flange-receiving opening 51 in the upper end wall 12 which is closed by the skid plate 48 that is secured to the wall 12 by spaced rivets 52 so that the opening 49 communicates with the compartment 3 of the cleaner 1.

The means for cleaning erasers also includes a strip brush 53, the body of which is disposed below the opening 49 and is held by a spring 54 in abutment with the lower edge of the flange 50 so that brush bristles 55 extend upwardly through the opening 49 and above the skid plate 48. The lower portion of the spring 48 is secured in place by a bolt 56 which in turn is secured to a lower side 57 of a U-shaped, brush-retaining cage 58 having opposite perforated sides 59, the upper outturned portions of which are secured by rivets 59*a* to the skid plate 48. At the left end of the cage 58 (FIG. 4) a U-shaped end plate 60 retains the brush 53 in place to prevent its being dislodged. Likewise, a U-shaped end plate 60*a* is mounted on the inner surface of the panel 21 (FIG. 10) at the other end of the cage for the same purpose.

When the motor 4 is turned on for operating the fan 5, air is drawn into the cleaner through the opening 49 around the brush 53 which is depressed by a chalk dusty eraser that is placed over the opening on the brush bristles 55. The opening 49 is long enough to accommodate two erasers placed side by side at one time. A back and forth movement of an eraser over the opening causes the bristles 55 to loosen chalk dust particles from the felt surface, which particles are drawn into the cleaner by the inwardly moving air. Pressure of an eraser upon the bristles overcomes the upward force of the spring 54. However, as soon as an eraser is removed from the opening 49, the spring 54 returns the eraser to the position shown in FIG. 4. When the fan 5 is operating without an eraser being cleaned, the brush body 53 is held snugly in place against the lower end of the flange 50, as shown in FIG. 4. As shown in FIG. 7, one side of the brush body is provided with a longitudinally extending notch 62 below one of the longitudinal portions of the flange 50, whereby air leaks through the opening 49 into the compartment 3 through the notch to prevent the motor 4 from becoming overheated due to lack of air moving through the cleaner.

The means for cleaning erasers also includes an insert or crevice member 63. The member 63 is composed of a pair of formed sheet metal parts 64 and 65 placed in an edge-to-edge abutment (FIGS. 9 and 11). Each part 64 and 65 has a slightly arcuate configuration which when combined provides an inner chamber 66. Each part also includes an outturned flange 67 and extends through an opening 68 in the panel 21. The flanges 67 are secured to the portions of the panel on opposite sides of the opening 68 by similar rivets 69.

In addition, each part 64 and 65 is provided with two spaced openings 70 and 71 and the central portion of each part has a depression 72 (FIG. 11) which extends between the spaced openings 70 and 71 of each part. The parts 64 and 65 are permanently secured together by a weld or solder joint 73. Accordingly, the pairs of openings 70 and 71 are oppositely disposed and communicate with the chamber 66 between the parts 64 and 65, which chamber in turn communicates with the inner compartment 3 of the cleaner 1.

As shown in FIG. 9, the insert or crevice member 63 is used to remove chalk particles from the interstices of adjacent layers or laminations of felt 74 of an eraser 75, as indicated by the broken lines of FIG. 9. When the member 63 is inserted between two adjacent layers 74, the suction created within the compartment 3 is applied through the openings 70 and 71 as well as the interconnecting depressions 72 to the surfaces of the felt layers and thereby removes the dust particles by sucking them into the cleaner.

It has been found that an efficient eraser cleaning operation cannot be accomplished without removing the dust from between the layers of an eraser, because if the dust is permitted to accumulate, it subsequently dusts out or is transferred to other surfaces being erased during erasure of a blackboard.

Inasmuch as the bristles 55 of the brush 53 require replacement from time to time, the brush is removable from the position shown in FIG. 4. As shown in FIG. 8, the brush may be removed through the upper end of the front of the cleaner 1 by removal of the panel 21. During successive operations of the cleaner, the chalk dust particles accumulate on the entire inner surface of the paper bag 32 and thereby progressively reduce the over-all efficiency by lowering the suction created at the opening 49. Although it is preferable to replace the paper bag 32 at frequent intervals, the cloth filter 31 may be provided with alternate means for partially meeting the problem.

As shown in FIG. 13, a cloth filter bag 76 is provided with an inner paper bag 77. The outer cloth bag 76 is provided with preferably four spaced strips of elastic 78, the extremities of which are secured at upper and lower ends to upper and lower end portions of the bag. The length of each strip of elastic 78 is shorter than the length of the extended bag 76 but during operation of the cleaner the suction created within the compartment 3 extends the bag fully to the broken line position of FIG. 13, thereby stretching the elastic members 78 to their complete length.

During the operation chalk dust particles 79 cover the inner surface of the paper bag 77 with a fine, tightly adhering layer of dust which quickly reduces the efficiency of the cleaner. When the cleaner is turned off and the suction is removed, the elastic strips 76 contract the inner and outer filter bags 76 and 77 to the position shown in FIG. 13 and thereby wrinkle the inner paper bag and cause the chalk dust particles 79 to fall from the sides to the bottom of the bag, thereby leaving the sides of the paper bag uncovered for efficient subsequent operation.

An alternate form of the eraser cleaner is generally indicated at 80 in FIG. 14. The cleaner 80 is in the form of an attachment for a conventional tank-type suction cleaner, for which reason it is provided with a suction attachment 81 which is attachable to the end of a conventional flexible suction cleaner hose. The cleaner 80 is composed primarily of a suction box of rectangular configuration including opposite walls 82 and 83, end walls 84 and 85, as well as top and bottom walls 86 and 87. In all other respects the cleaner 80 resembles the upper end of the cleaner 1. That is, it includes eraser cleaning means generally indicated at 88 and 89 for cleaning the outer surface and inner interstices of an eraser. Thus the means 88 includes a brush 53 mounted within a brush-retaining cage 58 and held in place by a U-shaped spring 54. The top wall 86 is provided with an opennig 90 similar to the opening 49 in that it includes an inturned continuous flange 91. Likewise, the means 89 is identical to the insert or crevice member 63 except that it is located in the same top wall 86 of the cleaner 80 as the brush 53 instead of being located on another wall.

Suffice it to say, the insert or crevice member or means 89 is spaced from the means 88 for the same reason the insert or crevice member 63 is spaced from the opening 49 in the skid plate 48. The means may be used separately for the cleaning operation. The surfaces of the eraser felts may be cleaned by the bristles 55 in one operation and in another operation or simultaneously, another eraser may be cleaned by the insert or crevice member 63 or 89. As shown in FIGS. 14–16, the top wall 86 has a downwardly inclined peripheral flange 92 to facilitate the sliding of an eraser back and forth over the opening 90.

The device of the present invention provides a black-

board eraser cleaner which is conducive to a highly efficient eraser cleaning operation. Due to the airtightness of the casing or housing, the suction created at the eraser cleaning locations is increased. At the same time, the cleaner functions without detriment to a blackboard eraser, there being no moving parts except the strip brush which merely yields to the application of force when an eraser is moved over the opening in the skid plate.

The blackboard eraser cleaner of the present invention is a substantially foolproof device in that it is practically indestructible in the event of attack by schoolboys having vandalic inclinations. For that purpose the clamps **18** are provided with openings **93** (FIG. 2) whereby padlocks may be attached to prevent access to the interior of the cleaner if such precautions prove necessary.

Although the cleaner is preferably vertically mounted, it may be used horizontally. Finally, it need not be permanently mounted on a wall but may be a portable device by being provided with castors or a stand.

In the foregoing description certain terms have been used for brevity, clearness and understanding, but no unnecessary limitations have been implied therefrom as such words are used for descriptive purposes and are intended to be broadly construed.

Moreover, the embodiments of the improved construction illustrated and described herein are by way of example and the scope of the present invention is not limited to the exact construction shown.

Having now described the invention, construction, operation and use of preferred embodiments thereof and the advantageous, new and useful results obtained thereby; the new and useful blackboard eraser cleaner and reasonable mechanical equivalents thereof obvious to those skilled in the art are set forth in the appended claims.

What is claimed is:

1. A blackboard eraser cleaner for removing chalk dust particles from an eraser composed of a number of felt strips, the cleaner including walls forming an air suction compartment, air inlet means for removing dust particles from the felt strips, said means including an elongated opening in one of the walls communicating with the compartment, a strip brush body mounted within the compartment and extending over the opening, the brush having bristles extending through and beyond the opening, a flange portion of the wall surrounding the opening and extending into the compartment and including an inturned edge, and spring means within the compartment for yieldingly holding the brush against the inturned edge of the flange portion.

2. The blackboard eraser cleaner construction of claim 1 in which the strip brush body is provided with notch means along one side of the brush forming an air leakage space adjacent an edge portion of the inturned flange.

3. A blackboard eraser cleaner for removing chalk dust particles from an eraser composed of a number of felt strips, the cleaner including walls forming an elongated housing, air inlet means at one end and air outlet means at the other end of the housing, a source of suction in the housing near the outlet means, air filter means in the housing between the air inlet means and the source of suction, the air inlet means including an elongated opening, the walls including an inturned flange portion around the opening, a strip brush body mounted in the compartment and extending over the opening, the brush body having bristles extending through and beyond the opening, and spring means within the compartment for yieldingly holding the brush body against the inner end of the flange portion.

4. A blackboard eraser cleaner for removing chalk dust particles from an eraser composed of a number of felt strips, the cleaner including walls forming an elongated housing, air inlet means at one end and air outlet means at the other end of the housing, a source of suction in the housing near the outlet means, air filter means in the housing between the air inlet means and the source of suction, the air inlet means including an elongated opening, a strip brush body mounted in the compartment and extending over the opening, the brush body having bristles extending through and beyond the opening, spring means within the compartment for yieldingly holding the brush in place, the air inlet means including a second opening in one wall of the housing communicating with the interior of the housing and spaced from the first opening, an insert crevice member projecting from the second opening, and the member having air inlet holes communicating with the interior of the housing, whereby the member may be inserted between the felt strips of an eraser for removing chalk dust particles therefrom.

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