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(54) **DUST-COLLECTING DEVICE AND VACUUM CLEANER**

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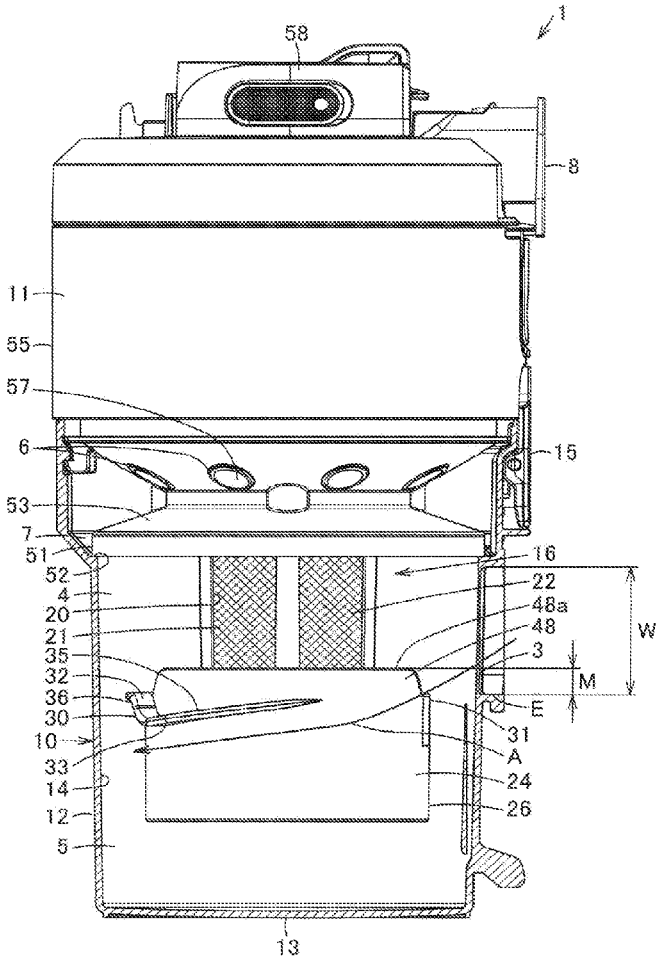
(57) **ABSTRACT**

A dust collecting device achieving higher efficiency in dust-and-dirt separation while suppressing adhesion of dust and dirt, and a vacuum cleaner equipped therewith. The dust-collecting device includes a cylindrical casing and an insertion part. The casing includes an introduction port allowing dust-containing air to be introduced inside. The insertion part is disposed inside the casing to allow swirling flow of the dust-containing air to be formed between the insertion part and an inner surface of the casing. The insertion part includes a cylindrical enlarged part, an opening part, and a wall part. The opening part is formed on a surface of the enlarged part in a side of a first centrifuge separator. The wall part projects at least at a position corresponding to an outside of the opening part, from the surface of the enlarged part in the side of the first centrifuge separator, toward the first centrifuge separator.



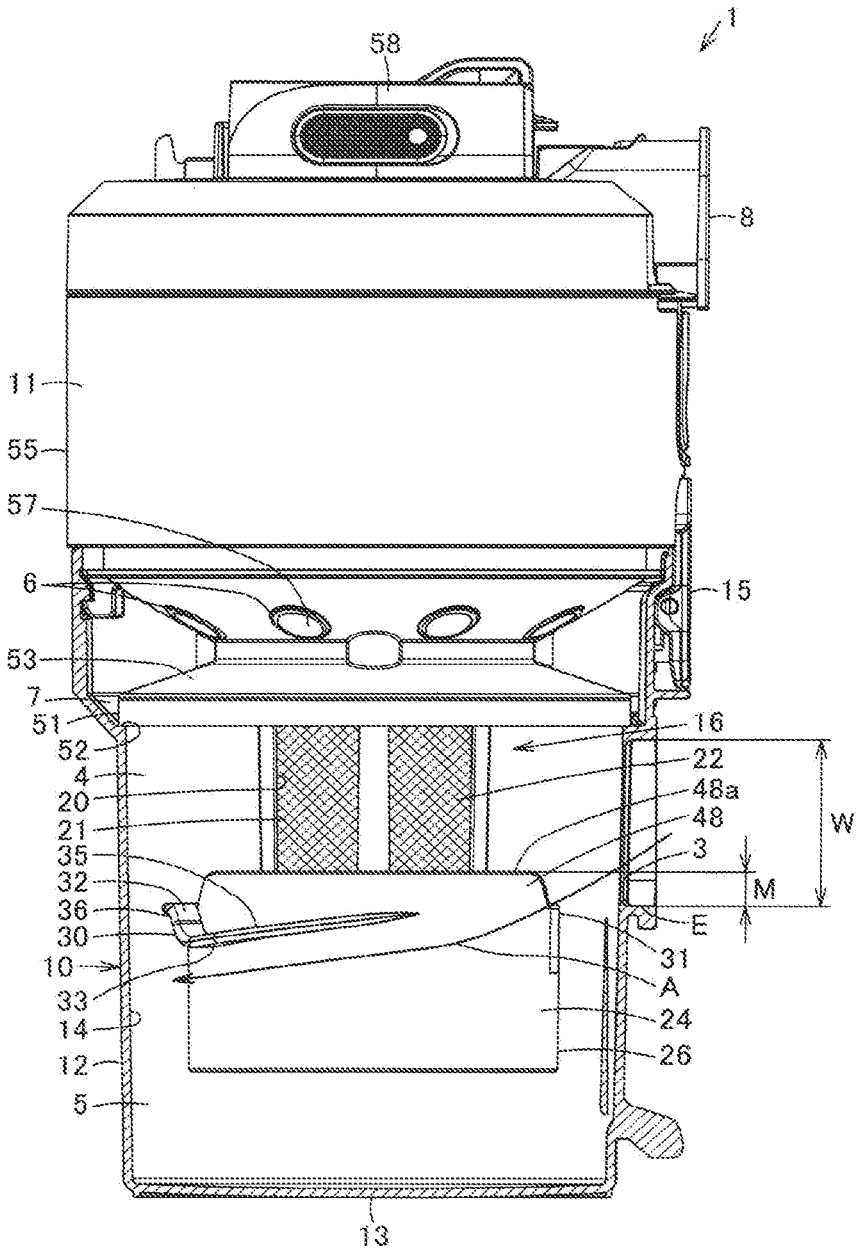

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FIG. 1

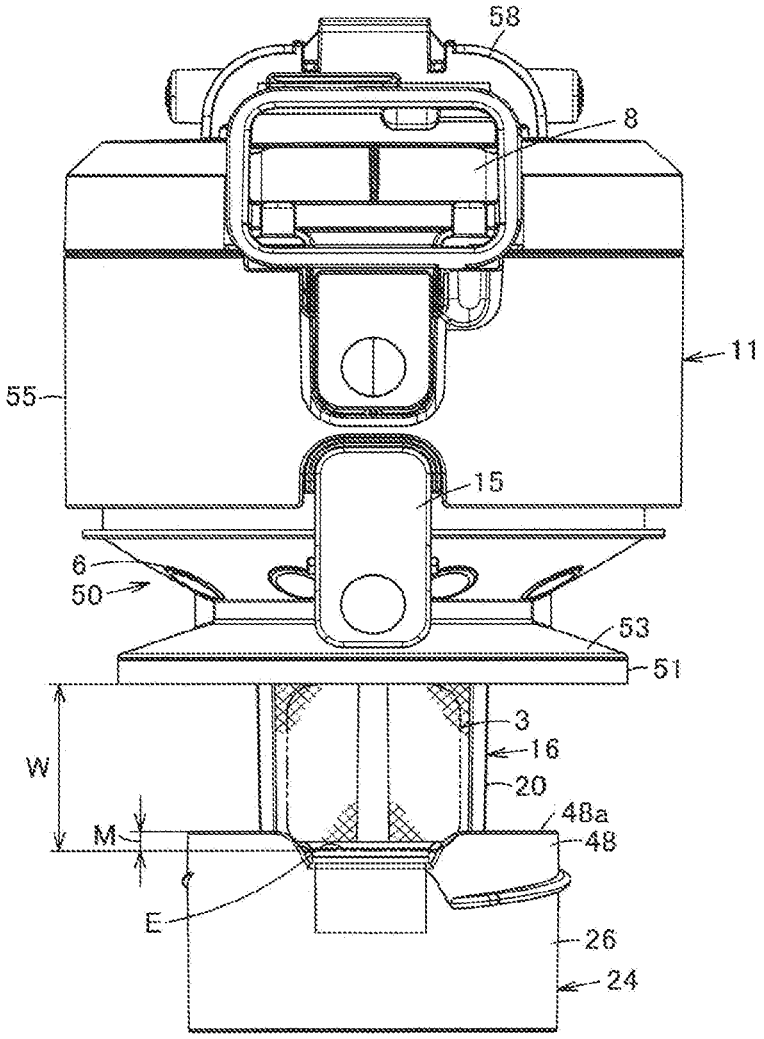

FIG. 2

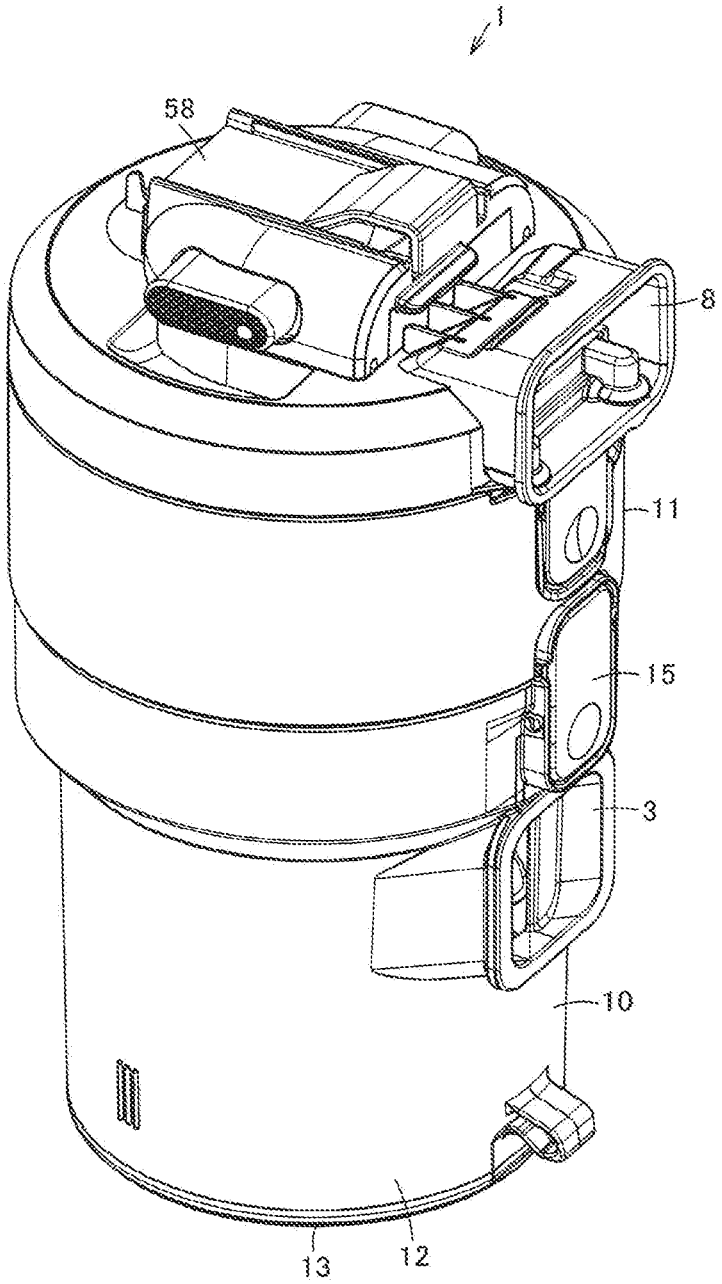

FIG. 3

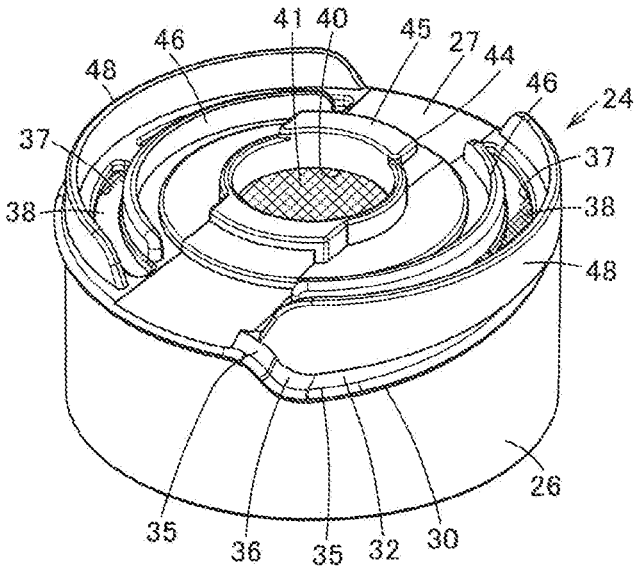
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FIG. 4

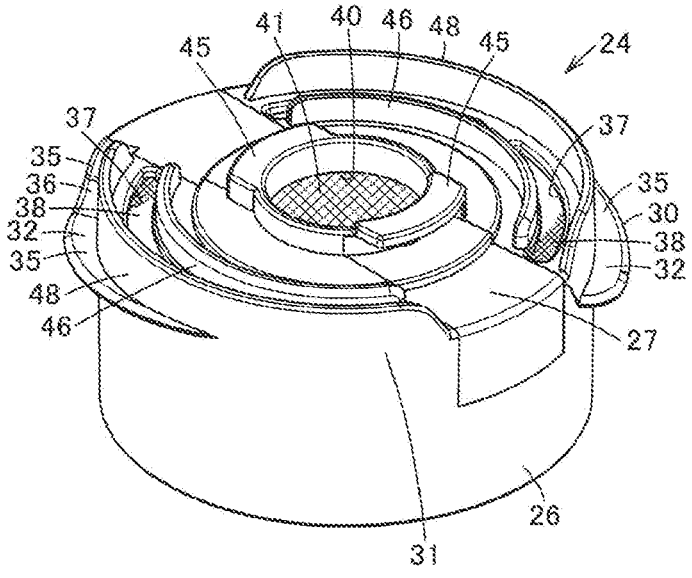
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FIG. 5

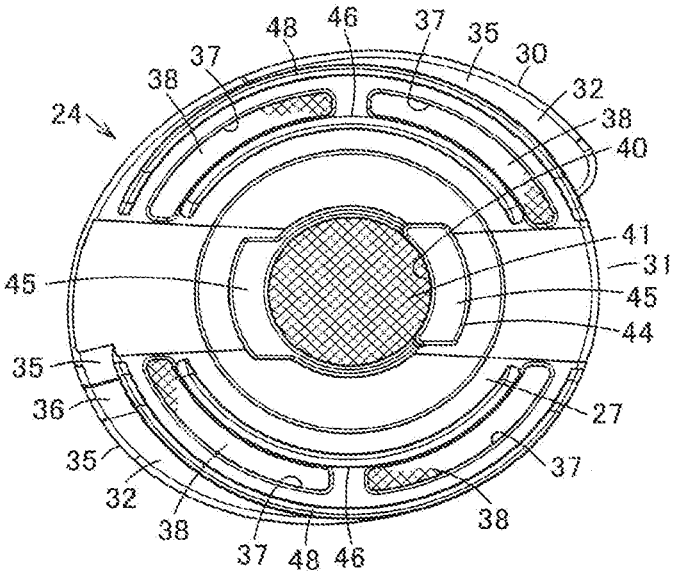
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FIG. 6

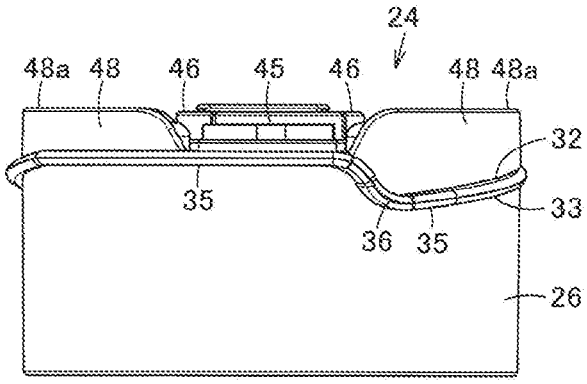
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FIG. 7

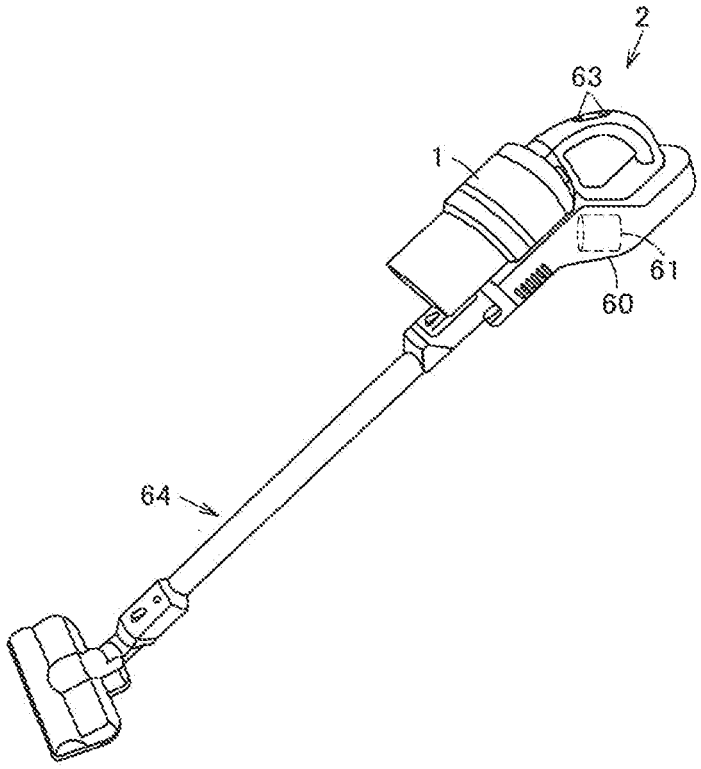

FIG. 8

DUST-COLLECTING DEVICE AND VACUUM CLEANER

TECHNICAL FIELD

[0001] Embodiments described herein relate generally to a dust-collecting device having a separator configured to centrifugally separate dust and dirt by swirling dust-containing air and a dust-collecting part configured to accumulate the dust and dirt separated by the separator, and a vacuum cleaner including the dust-collecting device.

BACKGROUND ART

[0002] Some conventional dust-collecting devices for use in a vacuum cleaner are configured to centrifugally separate dust and dirt by swirling dust-containing air. Such a dust-collecting device includes a cylindrical casing housing a separator disposed in the upper part thereof and a dust-collecting part disposed in the lower part thereof, and an exhaust pipe disposed inside and coaxially with the casing, and is configured to centrifugally separate dust and dirt by swirling dust-containing air between the inner surface of the casing and the exhaust pipe.

[0003] A known dust-collecting device includes, for example, a wall projecting toward a separator, disposed at the outer edge part of a shielding member disposed at the boundary part between the separator and a dust-collecting part, in order to suppress dust and dirt from adhering to an exhaust pipe and to achieve higher performance in dust-and-dirt separation. However, the suppression of adhesion of dust and dirt to an exhaust pipe and the performance in dust-and-dirt separation shall be further improved.

CITATION LIST

Patent Literature

[0004] PTL 1: Patent Publication No. 3788589

SUMMARY OF INVENTION

Technical Problem

[0005] The present invention aims to provide a dust-collecting device achieving higher performance in dust-and-dirt separation while suppressing adhesion of dust and dirt, and a vacuum cleaner equipped therewith.

Solution to Problem

[0006] A dust-collecting device of the present embodiment includes a separator configured to centrifugally separate dust and dirt by swirling dust-containing air, and a dust-collecting part configured to accumulate the dust and dirt separated by the separator. The dust-collecting device includes a cylindrical casing and a structure. The casing has an introduction port allowing the dust-containing air to be introduced inside. The structure is disposed inside the casing so as to allow swirling flow of the dust-containing air to be formed between the structure and an inner surface of the casing. The structure includes a cylindrical enlarged part, an opening part, and a wall part. The opening part is formed on a surface of the enlarged part in a side of the separator. The wall part projects at least at a position corresponding to an outside of the opening part, from the surface of the enlarged part in the side of the separator, toward the separator.

BRIEF DESCRIPTION OF DRAWINGS

[0007] FIG. **1** is a side view illustrating a dust-collecting device of one embodiment, with its one part cut out.

[0008] FIG. **2** is a side view partially illustrating the above dust-collecting device.

[0009] FIG. **3** is an oblique view illustrating the above dust-collecting device.

[0010] FIG. **4** is an oblique view partially illustrating a structure of the above dust-collecting device.

[0011] FIG. **5** is an oblique view partially illustrating the structure of the above dust-collecting device, viewed from an opposite direction to the one of FIG. **4**.

[0012] FIG. **6** is a plan view partially illustrating the structure of the above dust-collecting device.

[0013] FIG. **7** is a side view partially illustrating the structure of the above dust-collecting device.

[0014] FIG. **8** is an oblique view illustrating a vacuum cleaner including the above dust-collecting device.

DESCRIPTION OF EMBODIMENTS

[0015] One embodiment will be described below with reference to FIG. **1** to FIG. **8**.

[0016] In FIG. **1** to FIG. **3**, reference sign **1** denotes a dust-collecting device. The dust-collecting device **1** is configured to centrifugally separate and collect dust and dirt from the dust-containing air sucked by a suction source, and is used in a vacuum cleaner **2** to be described later.

[0017] The dust-collecting device **1** is a centrifugally-separating-type dust-collecting device configured to centrifugally separate dust and dirt by swirling dust-containing air. The dust-collecting device **1** includes, as air path components, an introduction port **3** through which dust-containing air is introduced, a first centrifuge separator **4** which is a separator configured to centrifugally separate dust and dirt from the dust-containing air introduced through the introduction port **3**, a first dust-collecting part **5** which is a dust-collecting part configured to catch and collect the dust and dirt separated by the first centrifuge separator **4**, a plurality of second centrifuge separators **6**, as an example, which are disposed to further centrifugally separate the remaining dust and dirt which has not been separated by the first centrifuge separator **4**, a second dust-collecting part **7** configured to catch and collect the dust and dirt separated by the second centrifuge separators **6**, and a discharge port **8** through which the air after separation of dust and dirt is discharged. That is, the dust-collecting device **1** in the present embodiment includes centrifuge separators in multiple steps. The second centrifuge separators **6** or the second dust-collecting part **7** are not essential components.

[0018] Moreover, the dust-collecting device **1** structurally includes a casing **10** and a separator **11**, and the casing **10** and the separator **11** are attachable and detachable.

[0019] The casing **10** is formed of, for example, synthetic resin in a cylindrical shape. In the present embodiment, the casing **10** is formed in a bottomed cylindrical shape. The casing **10** thus includes a cylindrical-shape outer peripheral surface part **12** which is an external surface part, a bottom part **13** covering the end part of the outer peripheral surface part **12**, and an inner surface **14** formed in a cylindrical shape, so that one end side, that is, the upper side in FIG. **1** is opened. The casing **11** includes the introduction port **3**, so that dust-containing air is introduced through the introduction port **3** to flow along the inner surface **14** of the casing

11, and forms swirling flow. The casing **10** houses the first centrifuge separator **4** in the one end side, that is, in the upper side in FIG. **1**, and the first dust-collecting part **5** in the other end side, that is, in the lower side in FIG. **1**.

[0020] The separator **11** is detachably engaged with the casing **10** by an engaging part **15**. The separator **11** includes an insertion part **16** which is a structure positioned inside the casing **10**. The swirling flow of dust-containing air is formed between the insertion part **16** and the inner surface **14** of the casing **10**. In an example, the insertion part **16** is disposed coaxially or substantially coaxially with the casing **10**. Furthermore, the insertion part **16** includes an exhaust pipe **20**, which is a cylindrical ventilation part allowing to discharge air from the first centrifuge separator **4**. The exhaust pipe **20** is formed in a cylindrical shape. The exhaust pipe **20** includes a ventilation hole **21**. For example, a plurality of the ventilation holes **21** are formed on the peripheral surface of the exhaust pipe **20**. Moreover, the ventilation holes **21** may be covered with, for example, a discharge filter **22** serving as a filter.

[0021] The insertion part **16** further includes a cylindrical enlarged part **24**. As shown in FIG. **1**, FIG. **2**, and FIG. **4** to FIG. **7**, the enlarged part **24** forms a boundary between the first centrifuge separator **4** and the first dust-collecting part **5**. Also, the enlarged part **24** is positioned in the side of the first dust-collecting part **5** with respect to the exhaust pipe **20**. Furthermore, the enlarged part **24** is formed so as to be enlarged more outward than the exhaust pipe **20**. That is, the enlarged part **24** is formed so as to have a larger diameter than the exhaust pipe **20**. Moreover, the enlarged part **24** is disposed coaxially or substantially coaxially with the exhaust pipe **20**. The enlarged part **24** is formed in a cylindrical shape with lid, so as to have an opening in the side of the first dust-collecting part **5**, that is, in the facing side to the bottom part **13** of the casing **10**. Thus, the enlarged part **24** includes a cylindrical side surface part **26** and a top surface part **27**, which is a surface in the side of the exhaust pipe **20**.

[0022] In the present embodiment, the side surface part **26** is included in the outer peripheral surface of the enlarged part **24**. Also, the side surface part **26** is formed in a cylindrical shape so as to extend along the axial direction of the casing **10**. The side surface part **26** is spaced away from and faces the inner surface **14** of the casing **10**. That is, there is a space between the side surface part **26** and the inner surface **14** of the casing **10**. The space is formed narrower than the space between the exhaust pipe **20** and the inner surface **14** of the casing **10**. Accordingly, the swirling flow flows faster in the space between the side surface part **26** and the inner surface **14** of the casing **10**, compared to in the space between the exhaust pipe **20** and the inner surface **14** of the casing **10**. Also, the end part of the side surface part **26** facing the bottom part **13** is spaced away from the bottom part **13**. Moreover, the side surface part **26** includes a projection part **30**, which is a blade part. The projection part **30** projects outward from the side surface part **26**. That is, the projection part **30** projects in the radial direction of the side surface part **26**. The outer edge part of the projection part **30** is spaced away from the inner surface **14** of the casing **10**. In an example, the projection part **30** is formed continuously in the circumferential direction of the enlarged part **24**, and the both end parts thereof are disposed discontinuously so as to be spaced away from each other. That is, in the present embodiment, the projection part **30** includes an intermittent part **31**. The projection part **30** further includes a projection surface **32** in the side of the first dust-collecting part **5**. Furthermore, in the present embodiment, the projection part **30** is formed in a plate shape including an opposite-side projection surface **33** in the side of the first centrifuge separator **4** which is the opposite side to the projection surface **32**.

[0023] The intermittent part **31** is formed at a position facing the introduction port **3** in the downstream side of the swirling flow. That is, in the present embodiment, the projection part **30** is formed so as to be discontinuous at the position facing the introduction port **3**.

[0024] The projection surface **32** projects outward from the side surface part **26**. That is, the projection surface **32** is formed so as to project in the radial direction of the enlarged part **24**. The projection surface **32** is disposed in the side of the first dust-collecting part **5** with respect to the introduction port **3** at a position facing the introduction port **3**. Moreover, the projection surface **32** is disposed so that the upstream end thereof is positioned within a range no greater in length than the half the circumference of the swirling flow in the upstream side with respect to the introduction port **3**. The projection surface **32** includes a plurality of straightening parts **35** and a connection part **36** for connecting these straightening parts **35**.

[0025] Each of the straightening parts **35** is formed spirally toward the first dust-collecting part **5**, from the upstream side of the swirling flow of the dust-containing air to the downstream side. Each of the straightening parts **35** is formed so that the upstream end thereof projects from the side surface part **26**, gradually outward from the side of the introduction port **3** toward the downstream side of the swirling flow. In the present embodiment, for example, two straightening parts **35** are formed. That is, in the present embodiment, one of the straightening parts **35** is positioned in the upstream side of the swirling flow, and the other of the straightening parts **35** is positioned in the downstream side. The downstream end of the straightening part **35** positioned in the upstream side may be positioned in the upstream side of the swirling flow with respect to the upstream end of the straightening part **35** positioned in the downstream side, or alternatively may overlap in the circumference direction with the upstream end of the straightening part **35** positioned in the downstream side. Furthermore, each of the straightening parts **35** may project outward from the side surface part **26** by unfixed protruding extents at other positions than the upstream end, and the protruding extent may be increased or decreased at an arbitrary position. In an example, in the present embodiment, the downstream end of the straightening part **35** positioned in the downstream is formed so that the protruding extent from the side surface part **26** is gradually decreased toward the downstream side of the swirling flow.

[0026] The connection part **36** is formed so as to connect the downstream end side of one straightening part **35** and the upstream end side of another straightening part **35**. The connection part **36** is formed so as to be continued smoothly from the straightening parts **35**. In the present embodiment, the connection part **36** is formed so as to connect the downstream end side of the straightening part **35** positioned in the upstream side and the upstream end side of the straightening part **35** positioned in the downstream side. Thus, the connection part **36** is inclined to the side of the first centrifuge separator **4** from the downstream end side of the

straightening part **35** positioned in the upstream side toward the upstream end side of the straightening part **35** positioned in the downstream side. That is, the inclined direction of the connection part **36** is different from the inclined directions of the respective straightening parts **35**. Thus, the projection part **30** is formed so as to be curved at the position corresponding to the connection part **36**.

[0027] The opposite-side projection surface **33** is formed basically in parallel with the projection surface **32**. The opposite-side projection surface **33** may be formed so as to be inclined outward to the downstream side of the swirling flow at the position corresponding to the connection part **36**. That is, the opposite-side projection surface **33** may be formed so as to be inclined to the downstream side of the swirling flow with respect to the normal direction of the side surface part at the position.

[0028] It is noted that the projection surface **32** and the opposite-side projection surface **33** are not always formed in planar shapes, but may be formed in, for example, curved shapes toward the first centrifuge separator **4** or toward the first dust-collecting part **5**.

[0029] The top surface part **27** is formed along the direction intersecting with the axial direction of the exhaust pipe **20**. The top surface part **27** further includes an opening part **37**. The opening part **37** is formed on a portion of the top surface part **27** extended and enlarged more outward than the exhaust pipe **20**. A plurality of the opening parts **37** are formed along the outer edge part of the top surface part **27**, that is, along the outer circumference of the top surface part **27**. In an example, each of the opening parts **37** is formed as a long circular-arc hole curved along the circumferential direction. Moreover, the opening parts **37** are disposed so as to be spaced away from one another in the circumferential direction. The opening parts **37** may be covered with, for example, a ventilation filter **38** serving as a filter.

[0030] The top surface part **27** may include a ventilation opening **40**. The ventilation opening **40** is disposed at the center of the top surface part **27** facing the exhaust pipe **20**. The ventilation opening **40** is formed as, for example, a circular hole. Also, the ventilation opening **40** may be covered with a compression filter **41** serving as a filter.

[0031] The top surface part **27** may further include a connection part **44** configured to detachably connect the exhaust pipe **20** and the enlarged part **24**. In an example, the connection part may include an engagement part **45** which projects from the periphery of the ventilation opening **40** so as to be engaged with the end part of the exhaust pipe **20** in the side of the enlarged part **24**, and a positioning part **46** which projects toward the first centrifuge separator **4** from a position inside the opening parts **37** on the top surface part **27** so as to position the exhaust pipe **20**. It is noted that the connection part **44** is not an essential component.

[0032] The top surface part **27** further includes a wall part **48**. The wall part **48** is formed so as to project in a rib shape from the top surface part **27** toward the first centrifuge separator **4**. The wall part **48** is formed at least at a position corresponding to an outside position of the opening parts **37**. Specifically, the wall part **48** is disposed at a position outside the opening parts **37** at least partially along the opening parts **37**, and the end part of the wall part **48** may not reach to an end part of one of the opening parts **37**, may reach substantially to an end part of one of the opening parts **37**, or may extend over an end part of one of the opening parts **37**. Moreover, the wall part **48** includes an end part **48***a* in the side of the first centrifuge separator **4**, which projects toward the first centrifuge separator **4** over a position E which is the end part of the introduction port **3** in the side of the first dust-collecting part **5**. Furthermore, the wall part **48** is set so that a protruding extent M toward the first centrifuge separator **4**, of the end part **48***a* of the wall part **48** in the side of the first centrifuge separator **4** over the position E of the end part of the introduction port **3** in the side of the first dust-collecting part **5** is equal to or less than ¼ of a width W of the introduction port in the axis direction which is the longitudinal direction of the casing **10**. It is noted that the top surface part **27** in the side of the exhaust pipe **20** may be positioned, for example, on the flush surface or substantially on the flush surface as the position E of the end part of the introduction port **3** in the side of the first dust-collecting part **5**, may be positioned in the side of the first centrifuge separator **4**, or may be positioned in the side of the first dust-collecting part **5**. In an example, a pair of the wall parts **48** is formed. The wall parts **48** are disposed so as to be spaced away from each other at the position facing the introduction port **3** and the opposite position. Thus, the wall parts **48** are formed in curved circular-arc shapes when viewed in the axial direction.

[0033] The separator **11** includes a sectioning part **50**. The sectioning part **50** is a part for separating the second dust-collecting part **7** from the casing **10**. The sectioning part **50** includes, for example, a sealing member **51**. The sealing member **51** seals the one end side of the casing **10** by being pressed against a step gap part **52** which is formed so as to be enlarged on the one end side of the casing **10**, and separates, from the first centrifuge separator **4** and the first dust-collecting part **5**, a portion positioned in the one end side of the casing **10** with respect to the step gap part **52** as the second dust-collecting part **7**. Moreover, the sectioning part **50** may include a slope part **53** which is a dust introducing part allowing to introduce the dust and dirt centrifugally separated by the second centrifuge separators **6** into the second dust-collecting part **7**.

[0034] The separator **11** further includes a separation main body **55** which covers a part in the one end side of the casing **10**. The separation main body **55** is positioned outside the casing **10**. The separation main body **55** houses an air introducing part not shown allowing to introduce the air discharged through the exhaust pipe **20**, into the second centrifuge separators **6**. The separation main body **55** further houses a plurality of cone parts **57** included in the second centrifuge separators **6**. The cone parts **57** are formed each in a cone shape having a diameter decreasing toward the casing **10**, and are disposed annularly. Each of the cone parts **57** is configured to separate dust and dirt by swirling the dust-containing air introduced inside, and discharge the separated dust and dirt through the slope part **53** into the second dust-collecting part **7**. The separation main body **55** further houses an air discharge part not shown allowing to introduce air discharged from the second centrifuge separators **6** to the discharge port **8**. In an example, a filter may be disposed to the air discharge part. The separation main body **55** includes the discharge port **8**. The separation main body **55** may further include an attaching/detaching mechanism **58** configured to attach and detach the dust-collecting device **1** to and from the vacuum cleaner **2**.

[0035] The vacuum cleaner **2** includes a main body **60** to which the dust-collecting device **1** is attached detachably. The vacuum cleaner **2** further includes an electric blower **61**

serving as a suction source. The vacuum cleaner **2** further includes a control part not shown configured to control operations of the electric blower **61**. The vacuum cleaner **2** further includes an operation part **63** through which operations to start and stop the electric blower **61** are input. In the present embodiment, the vacuum cleaner **2** is described by use of, as an example, a long stick type vacuum cleaner including an air path body **64** which is attachable to and detachable from the longitudinal main body **60**. Alternatively, the vacuum cleaner **2** may be, for example, a canister type vacuum cleaner having the main body **60** capable of traveling on a floor surface, or may be a self-propelled type vacuum cleaner capable of traveling autonomously.

[0036] The operations in the above-described embodiment are described next.

[0037] When performing cleaning by use of the vacuum cleaner **11**, a user attaches the dust-collecting device **1** to the main body **60**, and operates the operation part **63** to make the electric blower **61** operate and suck dust and dirt together with air from a cleaning-object surface through the air path body **64**, by utilizing the negative pressure generated by driving of the electric blower **61**.

[0038] Dust-containing air is sucked through the air path body **64** via the main body **60** and thereafter from the introduction port **3** into the dust-collecting device **1**. At this time, the dust-containing air is introduced through the introduction port **3** along the tangential direction of the inner surface **14** of the casing **10**, and generates a swirling flow A between the insertion part **16** and the inner surface **14** of the casing **10**.

[0039] The swirling flow A swirls between the exhaust pipe **20** and the inner surface **14** so that the first centrifuge separator **4** centrifugally separates dust and dirt, increases in flow velocity between the side surface part **26** of the enlarged part **24** and the inner surface **14**, and flows into the first dust-collecting part **5** while swirling along the projection part **30**. At this time, dust and dirt is pressed gradually downward by the swirling flow A flowing along the respective straightening parts **35**.

[0040] The swirling flow A thereafter flows into the enlarged part **24**, and a part of the swirling flow A passes through the opening parts **37** and circulates, and the remaining thereof passes through the ventilation opening **40**. At this time, the dust and dirt accumulated in the first dust-collecting part **5** is pressed.

[0041] The dust-containing air which has passed through the exhaust pipe **20** is introduced from the air introducing part into the cone parts **57** of the second centrifuge separators **6**, and is made to swirl in the cone parts **57** so that finer dust and dirt is separated and accumulated in the second dust-collecting part **7**. The air after separation of dust and dirt is discharged via the air discharge part through the discharge port **8** to the outside of the dust-collecting device **1**, and is further sucked into the electric blower **61** to cool the electric blower **61**, and is thereafter exhausted.

[0042] In this case, when the dust and dirt accumulated in the first dust-collecting part **5** is increased, the swirling flow A hardly flows, and the dust-containing air is likely to flow toward the exhaust pipe **20** due to negative pressure. At this time, since the projection surface **32** includes the connection part **36** formed to connect the downstream end side of one straightening part **35** and the upstream end side of another straightening part **35**, the connection part **36** suppresses the dust-containing air from flowing toward the exhaust pipe **20** due to the negative pressure, resulting in enabling to suppress dust and dirt from being stirred up.

[0043] Since the projection part **30** includes the intermittent part **31** between at least any two adjacent straightening parts **35**, relatively-large dust and dirt is carried through the intermittent part **31** without being caught by the projection part **30**, and is easily accumulated in the first dust-collecting part **5**.

[0044] Especially, since the intermittent part **31** is formed at a position facing the introduction port **3** in the downstream side of the swirling flow A, relatively-large dust and dirt in the dust-containing air introduced through the introduction port **3** is immediately carried through the intermittent part **31** and is easily accumulated in the first dust-collecting part **5**, thereby enabling to improve efficiency in dust-and-dirt separation.

[0045] Each of the straightening parts **35** is formed so that the upstream end thereof projects from the side surface part **26**, gradually outward from the side of the introduction port **3** toward the downstream side of the swirling flow A. Thus, the dust and dirt carried along the swirling flow A into the first dust-collecting part **5** is hardly caught by the projection part **30**.

[0046] Furthermore, the projection surface **32** is disposed at a position facing the introduction port **3** in the side of the first dust-collecting part **5** with respect to the introduction port **3**, and thus hardly hinders the dust-containing air from being introduced through the introduction port **3**.

[0047] The projection surface **32** is disposed so that the upstream end thereof is positioned within a range no greater in length than the half the circumference of the swirling flow A in the upstream side with respect to the introduction port **3**. Thus, the dust-containing air introduced through the introduction port **3** is guided efficiently, thereby enabling to form the swirling flow A.

[0048] The opposite-side projection surface **33** of the projection part **30**, which is opposite to the projection surface **32** and is positioned in the side of the first centrifuge separator **4**, is formed so as to be inclined outward to the downstream side of the swirling flow A at the position corresponding to the connection part **36**. Thus, the dust and dirt contained in the swirling flow A flowing along the opposite-side projection surface **33** is easily accumulated from the inclined position of the opposite-side projection surface **33** toward the first dust-collecting part **5**.

[0049] Furthermore, on the top surface part **27** positioned in the side of the exhaust pipe **20**, of the enlarged part **24** which is enlarged more outward than the cylindrical exhaust pipe **20** allowing to discharge the swirling flow A, the wall part **48** projects toward the first centrifuge separator **4** from the top surface part **27** of the enlarged part **24** in the side of the exhaust pipe **20**, corresponding to the outside of the opening parts **37** formed at the positions enlarged more outward than the exhaust pipe **20**, thereby enabling to strengthen the swirling flow A with a facing distance between the wall part **48** and the inner surface **14** of the casing **10**, and further allowing the wall part **48** to introduce the air flow passing through the opening parts **37** to the outside of the exhaust pipe **20**. Accordingly, this allows to improve efficiency in dust-and-dirt separation, while suppressing dust and dirt from adhering to the exhaust pipe **20**.

[0050] The end part **48***a* of the wall part **48** in the side of the first centrifuge separator **4** projects toward the first centrifuge separator **4** over the position E of the end part of

the introduction port **3** in the side of the first dust-collecting part **5**. This allows to strengthen the swirling flow A while ensuring an enough facing distance between the wall part **48** and the inner surface **14** of the casing **10**, thereby enabling to improve performance in dust-and-dirt separation.

[0051] The protruding extent M of the first centrifuge separator **4** of the end part **48***a* of the wall part **48** in the side of the first centrifuge separator **4** over the position E of the end part of the introduction port **3** in the side of the first dust-collecting part **5** is set equal to or less than ¼ of the width W of the introduction port in the longitudinal direction of the casing **10**. This allows to strengthen the swirling flow A while ensuring an enough facing distance between the wall part **48** and the inner surface **14** of the casing **10**, and the wall part **48** hardly hinders air flow from being sucked into the exhaust pipe **20**.

[0052] It is noted that, in the embodiment described above, the casing **10** includes the bottom part **13** which may be openable and closable, so that the dust and dirt accumulated in the first dust-collecting part **5** and the second dust-collecting part **7** is discharged from the bottom.

[0053] While certain embodiments have been described, these embodiments have been presented by way of example only, and are not intended to limit the scope of the inventions. Indeed, the novel embodiments described herein may be embodied in a variety of other forms; furthermore, various omissions, substitutions, and changes in the form of the embodiments described herein may be made without departing from the spirit of the inventions. The accompanying claims and their equivalents are intended to cover such forms or modifications as would fall within the scope and spirit of the inventions.

1. A dust-collecting device comprising a separator configured to centrifugally separate dust and dirt by swirling dust-containing air, and a dust-collecting part configured to accumulate the dust and dirt separated by the separator, the dust-collecting device comprising:

a cylindrical casing having an introduction port allowing the dust-containing air to be introduced inside; and

a structure disposed inside the casing so as to allow swirling flow of the dust-containing air to be formed between the structure and an inner surface of the casing,

the structure including:

a cylindrical enlarged part;

an opening part formed on a surface of the enlarged part in a side of the separator; and

a wall part projecting at least at a position corresponding to an outside of the opening part, from the surface of the enlarged part in the side of the separator, toward the separator.

2. The dust-collecting device according to claim **1**, wherein

the wall part includes an end part in the side of the separator, and the end part projects toward the separator over an end part of the introduction port in a side of the dust-collecting part.

3. The dust-collecting device according to claim **2**, wherein

a protruding extent of the end part of the wall part in the side of the separator projecting toward the separator over the end part of the introduction port in the side of the dust-collecting part is set equal to or less than ¼ of a width of the introduction port in a longitudinal direction of the casing.

4. The dust-collecting device according to claim **1**, wherein

a plurality of the opening parts are formed on the surface of the enlarged part in the side of the separator along an outer edge part of the surface.

5. The dust-collecting device according to claim **1**, wherein

the structure includes a cylindrical ventilation part allowing to discharge the swirling flow,

the enlarged part is positioned in the side of the dust-collecting part with respect to the ventilation part, and is enlarged more outward than the ventilation part, and

the opening part is formed at a portion enlarged more outward than the ventilation part on the surface of the enlarged part in the side of the separator.

6. A vacuum cleaner comprising the dust-collecting device according to claim **1**.

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