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**vom Berg et al.**

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[54] **SWEEPING MACHINE**


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Nov. 17, 1973 Germany ..... 2357467

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[51] **Int. Cl.**[2] ..... **E01H 1/04**

[58] **Field of Search** ..... 15/83, 84, 85, 86, 340



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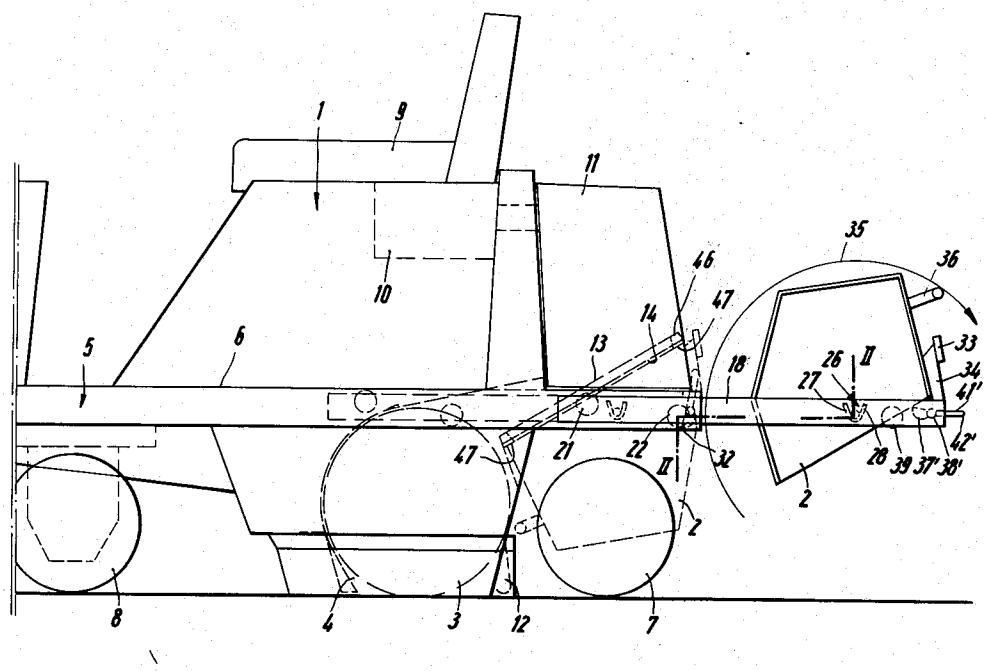
*Attorney, Agent, or Firm*—Toren, McGeady and Stanger



[57] **ABSTRACT**

A downwardly open brush housing is mounted on a wheeled chassis. A cylindrical brush is rotatably mounted in the brush housing. A dirt container is detachably connected to the brush housing. Frame section members extend along the chassis on both sides thereof. carriers are slidably guided in said frame section members in the longitudinal direction thereof. The dirt container is pivotally connected by bearing means to said carriers.


**11 Claims, 4 Drawing Figures**



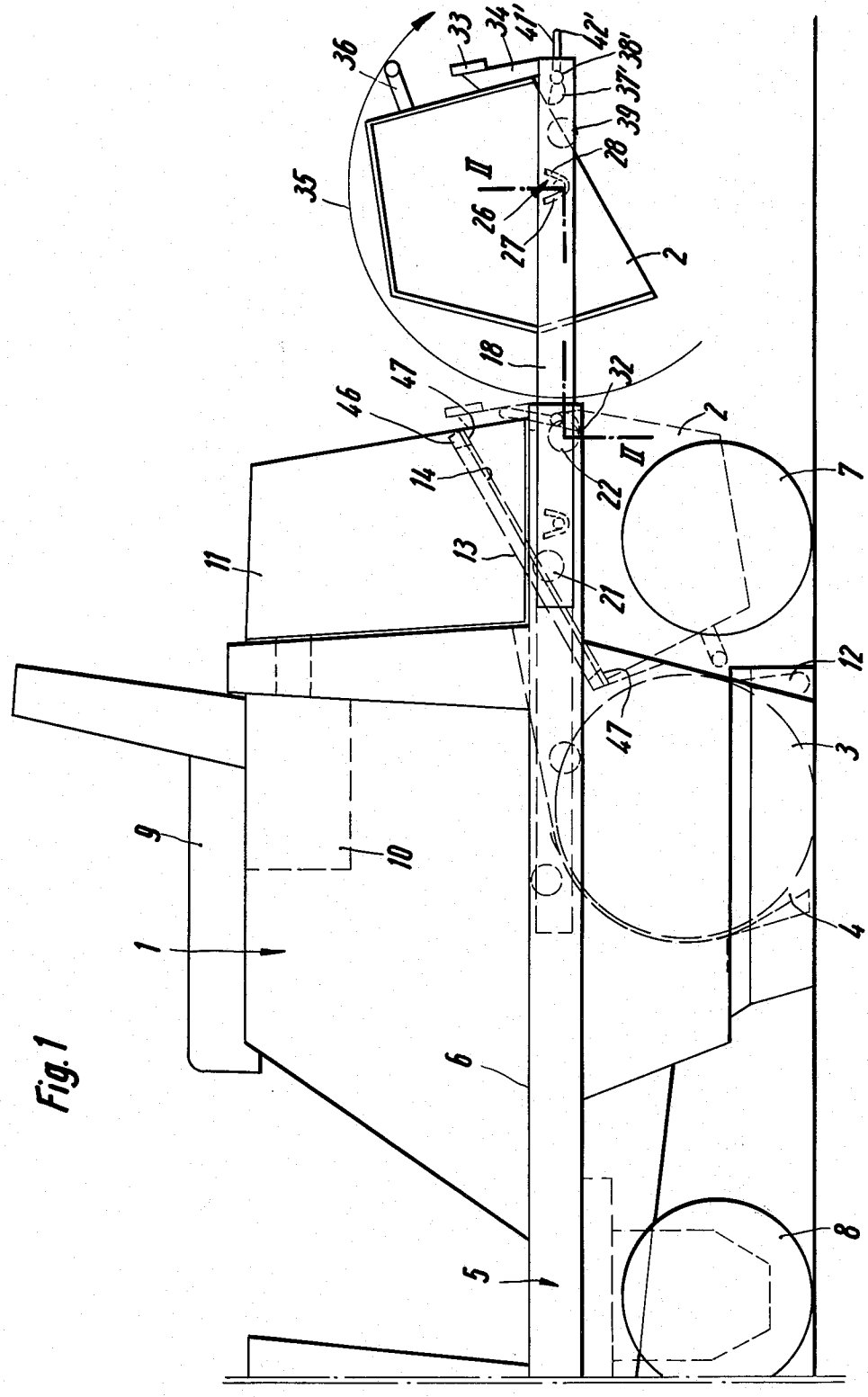

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41'
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Fig. 1

Fig. 4

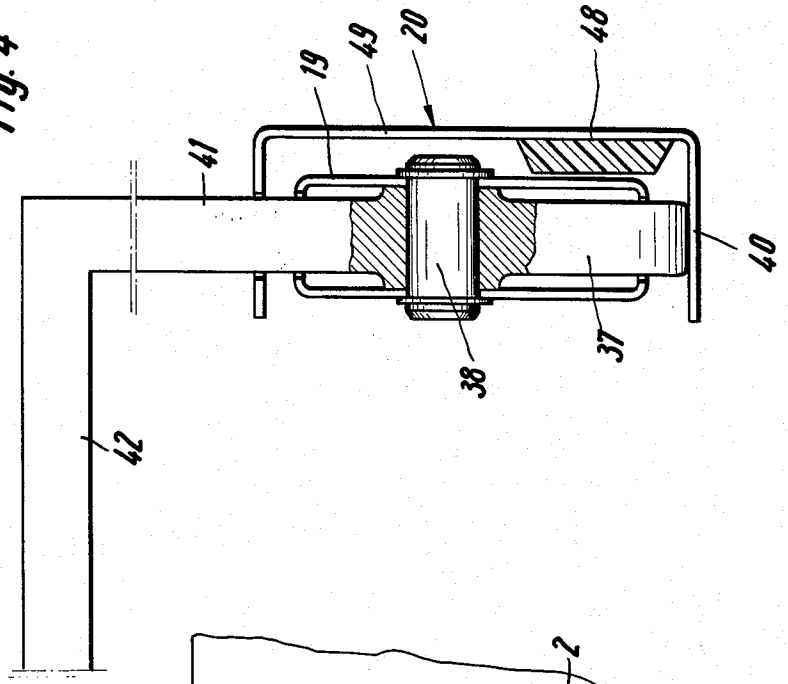



Fig. 2

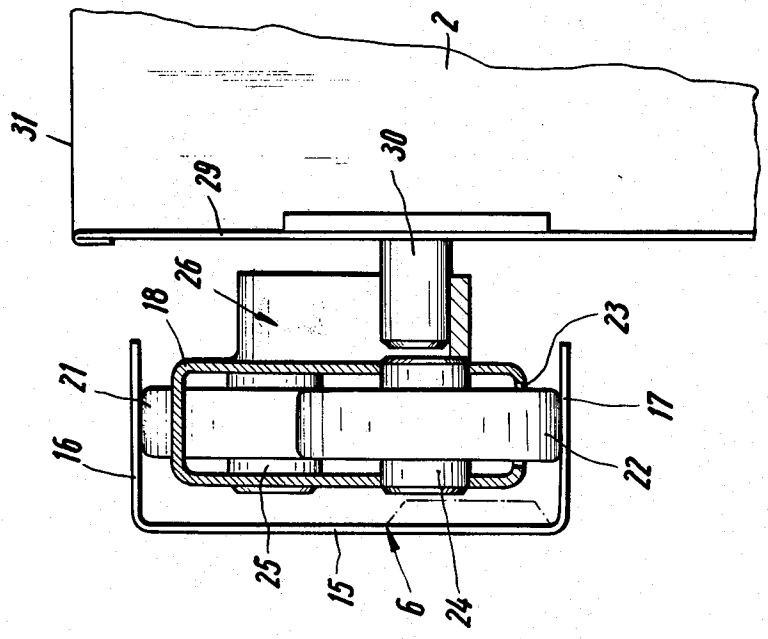
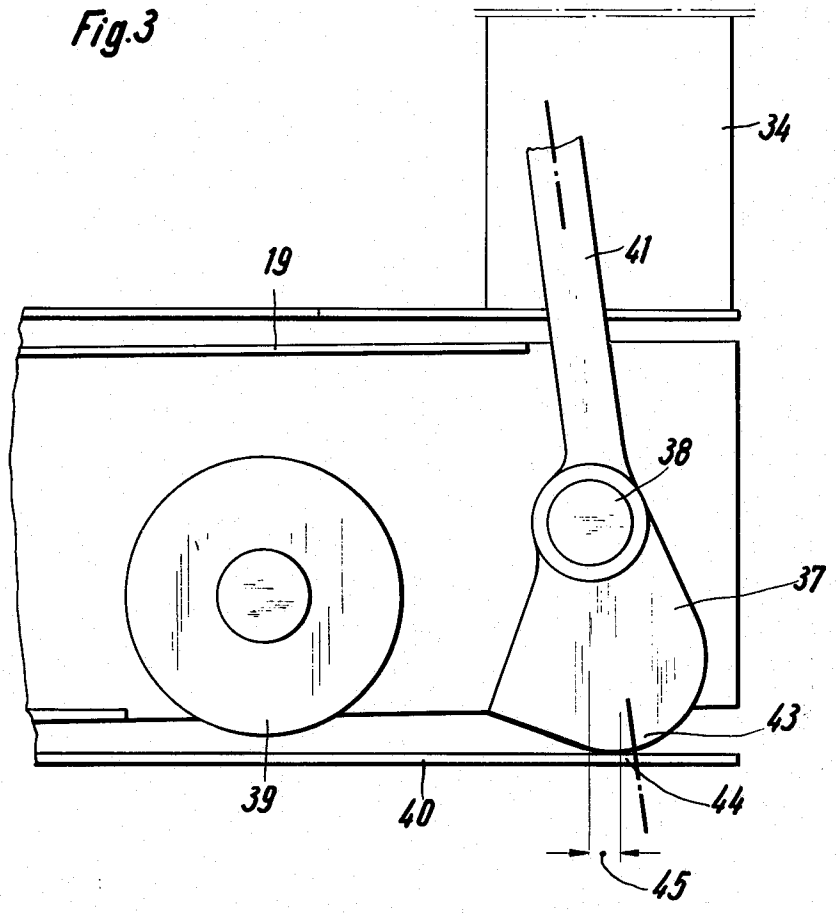


Fig.3



# SWEEPING MACHINE

This invention relates to a sweeping machine comprising a cylindrical rotary brush and a dirt container, which is disposed behind or before the brush and in which the dust is collected by being thrown over or as with a dustpan.

Specifically, the invention relates to a sweeping machine which comprises a suction fan and a filter system disposed between the suction fan and the dirt container. In such machines, the brush is disposed within a brush housing, which is open toward the street and provided with rubber-elastic seals for engaging the ground.

In a special embodiment, the sweeping machine, which is a self-propelled vehicle provided with wheels and a propulsion engine and, if desired, with a driver's seat, comprises in its vehicle body a vehicle frame, at least part of which extends over the sides adjacent to the dirt container.

If such self-collecting sweeping and vacuum cleaning machine collects the dust as with a dustpan, the dust container will be disposed before the brush, which sweeps up the dirt and throws it into the opening formed in the dust container and facing the brush. In other sweeping machines, particularly those consisting of relatively large vehicles, the dust is collected by being thrown over. In that case the dirt container is disposed behind the brush in the direction of travel and the dirt which has been picked up is thrown over the brush from the brush housing and from above into the dirt container.

The invention relates to sweeping machines, particularly sweeping and vacuum cleaning machines, of both types.

Large sweeping and vacuum cleaning machines comprise a hydraulic mechanism for lifting the dirt container when the same is to be emptied. Such lifting mechanisms are known in machines which collect the dirt by one of the methods described above.

In small machines, particularly in machines which are steered by means of a handle bar, the low-capacity dirt container is removable by hand when it is to be emptied. In spite of thee low capacity of the container, it is difficult and requires a large effort to empty the container, particularly when heavy dirt, such as chips of castings, iron parts, or the like, has been collected. In medium-size sweeping machines, a hydraulically actuated mechanism is required to lift the container when it is to be emptied. Most machines of that size have only mechanical propulsion systems so that a special hydraulic system must be installed for emptying the container.

The invention relates particularly to small and medium-size sweeping machines, particularly to sweeping and vacuum cleaning machines. It is an object of the invention so to improve a sweeping machine of the kind described first hereinbefore that the handling of the dirt container is much facilitated without need for a special lifting mechanism. The handling is to be facilitated so that the container can be emptied even when it is filled with heavy dirt, and that the container can be installed in the machine in a simple manner and without a great effort. This will be particularly important if sweeping machines must be operated by persons who do not have a high physical strength and are not mechanically skilled.

This object is accomplished according to the invention in that the dirt container is disposed in the body of



the sweeping machine and is pivoted to carriers, which are extensible out of said body. As a result, the dirt container carried by its carrier can be moved out of its operative position and out of the vehicle body by a person who does not have to carry the weight of the dirt container. Because the dirt container is pivotally mounted, it may be emptied before or behind the sweeping machine, depending on where the dirt container is disposed in accordance with the method of dirt collection which is adopted. As the carriers are retracted, the dirt container automatically resumes the position required for operation.

According to a particularly preferred feature, the body of the sweeping machine contains extensible slidable rails, on which the dirt container is mounted. The slidable rails are simple means. Within the scope of the invention, integral or composite slidable rails may be used. It will be of special advantage if the slidable rails are guided by load-carrying frame parts of the vehicle frame. In that case there is no need for separate parts for guiding the slidable rails so that the weight of the sweeping machine and the structural expenditure in general are reduced. In a sweeping machine in which the vehicle body comprises a vehicle frame which extends at least in part beyond the sides adjacent to the dirt container, each slidable rail is desirably guided by a frame section member which is open toward one end of the vehicle. The frame section member may be a box section, channel, I-section or the like. The rail may be guided in a slot of a vertical wall portion and is desirably guided between transversely extending upper and lower surfaces of the frame section member.

Within the scope of the invention, the extensible slidable rails my be guided in a direction which has a certain inclination to the surface which supports the vehicle. A downward inclination in the direction in which the rails are extended may be desirable because the laden dirt container is then moved along a downwardly inclined path. In this case, special detent or stop means may be provided to hold the dirt container in the retracted position. In a preferred embodiment, the slidable rails are guided in a substantially horizontal direction.

It will be possible to provide the slidable rails on their sliding surfaces with coverings of low-friction material. According to a preferred feature, each slidable rail is provided with at least two rollers, and that of said rollers which is disposed at the inner end of a slidable rail protrudes above the top of the rail whereas each roller which is spaced from said end roller protrudes below the underside of the slidable rail. In such an arrangement, only rolling friction must be overcome and the slidable rails may be used for an additional purpose, as will be described hereinafter, without need for additional means. The above-mentioned detent means may consist of detent recesses which are formed in the lower roller tracks of the frame section members and which receive the downwardly protruding rollers when the slidable rails have been retracted. When it is desired in such an arrangement to pull out the dirt container, it will be sufficient slightly to lift the carrying structure out of the slidable rails. Owing to the mechanical advantage, this will be easier than a lifting of the dirt container itself.

It will be of special advantage if the outer ends of the slidable rails are rigidly interconnected by a cross strut. The slidable rails and such strut form a forked carrier, which can be most easily handled. The cross strut

serves desirably as a handle.

According to another desirable feature the cross strut forms a stop, which extends preferably above the plane defined by the slidable rails and is arranged to be engaged by the pivoted dirt container when the same is in position to be emptied. This feature will greatly facilitate the handling of the dust container.

According to a desirable feature, pivot pins are provided on both sides of the dirt container and are inserted into bearing recesses, which are formed on the insides of the slidable rails and are open upwardly and toward each other. When a machine embodying that feature is used to collect light dirt, the dirt container can be emptied by hand directly into a dustbin or the like. The use of a removable dirt container has also the advantage that the access to the internal parts of the machine, such as a filter system and the brush, will be greatly facilitated.

To ensure that the dirt in the brush housing will be collected as completely as possible and particularly to prevent an ingress of by-padded air in conjunction with a suction fan, sweeping machines are provided with a sealing or contact edge which is engaged by the rim of the opening of the dirt container when the same has been retracted. If a suction fan succeeds a filter system, it will be essential to provided for a hermetic seal of the brush housing, the dirt container, and the filter system. Being provided with slidable rails, the machine according to the invention comprises means for lifting the outer ends of the retracted slidable rails so that the rim of the dirt container is forced against the contact edge. In that connection too it is desirable to use the above-mentioned rollers because the upwardly protruding rollers are provided only at the inner end of each slidable rail whereas the downwardly protruding rollers can be raised from their tracks. The rollers require in any case that the frame section members guiding the slidable rails have an oversize dimension in the vertical direction in which the slidable rails are pivotally movable.

The apparatus desirably comprises at least one eccentric cam, which is rotatably mounted on the slidable rails and which is rotatable to move a supporting portion of the cam below the plane which is defined by the rollers which protrude below the slidable rails. In that case the dirt container can be moved by simple means into sealing engagement. Two eccentric cams provided with actuating levers are desirably mounted on the slidable rails so that the cams can directly cooperate with the slideways or roller tracks for the slidable rails. According to a preferred feature, each eccentric cam has a supporting portion which is engageable with a supporting surface for a slidable rail, particularly the lower roller track, when the slidable rails are to be lifted, and said supporting portion is relieved at an angle within the range of self-locking angles to provide for a restraint of the rails in their retracted position. This restraint is suitably improved in that a vertical line extending through the axes of rotation of the cams onto their supporting surface is disposed before the point where the cams are supported, in the direction of the retracting movement of the slidable rails. Specifically, the cams are relieved to some extent adjacent to their point of support and can be moved through a dead center to their operative position. If the cams mounted on both slidable rails are connected by a cross-strut, which may be connected to the levers for the cams, a handle will be provided for moving the dirt container.



According to another desirable feature, a transverse carrier is rotatably mounted between the extensible ends of the slidable rails and is provided with at least one eccentric cam, which has associated with it a supporting surface disposed at least in the middle portion of the vehicle body.

The invention will now be explained with reference to an embodiment which is shown diagrammatically and by way of example on the accompanying drawings, in which

FIG. **1** is a fragmentary side elevation showing a sweeping and vacuum cleaning machine which comprises a dirt container that has been extended and pivotally moved,

FIG. **2** is a fragmentary sectional view taken on line II—II in FIG. **1**,

FIG. **3** is a fragmentary side elevation showing a portion of a slidable rail within the frame section member for guiding the rail, and

FIG. **4** is a sectional view taken on line IV—IV in FIG. **3** and showing a modification.

The invention will be explained with reference to a self-propelled sweeping machine **1**, in which the dirt is thrown over into a dirt container **2** disposed behind a rotary cylindrical brush **3**. The latter is mounted in a brush housing **4** disposed behind an outer enclosure. The vehicle body comprises a closed frame **5**, which is provided with frame section members, one of which is designated **6** in FIG. **1**.

The vehicle comprises two rear wheels **7**, only one of which is apparent from FIG. **1**, and has in front, e.g., only one steerable drive wheel **8**. Drive units are mounted under a driver's seat **9** and include, e.g., a suction fan **10**, which is connected to a filter system **11**. An opening is provided in the lower portion of the filter system and extends to the rear wall **12** of the brush housing **4** and is defined by a continuous peripheral sealing edge **13**, which conforms to the rim **14** which defines the opening of the dirt container **2**.

As is indicated by dotted lines in FIG. **1**, this sealing edge **13** is formed by an open-bottommed channel section **46**, which contains a seal **47**, which consists of rubber-elastic material and has an exposed undersurface. The top edge of the dirt container **2** is forced against that seal **47**. That top edge is narrow so that tolerances can be taken up by the wider seal and dirt cannot be retained at the edge of the dirt container **2** during the emptying operation.

The frame section members **6** are hollow sections and as shown in FIGS. **2** and **4** consist, e.g., of inwardly open channels having vertical wall portions **15** and transversely extending, top and bottom roller tracks **16, 17**. These frame section members are open toward the rear of the vehicle **1** and contain and guide integral slidable rails **18, 19** on opposite sides. In FIG. **2**, the slidable rail **18** is shown in section in FIG. **2** and in FIG. **4** the other slidable rail **19** is shown on the other side of the vehicle. The frame section member on the other side is designated **20**. For the sake of clearness, FIG. **1** shows in solid lines also that portion of the slidable rail **18** which remains in the frame section member **6** when the rail has been extended. At least two rollers **21, 22**, for instance, are mounted on each slidable rail. The roller **21** disposed at the inner end protrudes upwardly from the slidable rail. The other roller **22** which is nearer to the extensible end protrudes through an aperture **23** in the lower wall of the box-section slidable rail. The axes **24, 25** for the rollers may be guided in the side

walls of the slidable rails **18, 19** and bearings may be used for this purpose, if desired.

It is also apparent from FIG. **2** that open-topped bearing recesses **26** are provided in the inside surfaces of the slidable rails **18, 19.** These recesses have desirably downwardly converging entrance surfaces **27, 28** (FIG. **1**). Outwardly protruding trunnions **30** are mounted on the side walls **29** (FIG. **2**) of the dirt container **2** and are adapted to be inserted from above into the bearing recesses. The trunnions are desirably disposed on an axis which extends through the center of gravity of the dirt container so that the pivotal movement for emptying the container will be facilitated because the entrance opening **31** is swung down toward the street surface, as is shown in solid lines in FIG. **1.**

FIG. **2** shows also the slidable rails in a position in which the rails are extended only to such an extent that the rollers **21, 22** are still within the frame section member **6.** The slidable rails may be adapted to be locked in this position by separate detent means, e.g., by a recess which is disposed at **32** in the lower roller track **17** and which automatically receives the roller **22.**

The two slidable rails **18, 19** are preferably provided at their extensible rear end by a cross strut **33.** This arrangement provides a forklike, inherently rigid carrier, which can easily be handled and automatically ensures a parallel movement of the slidable rails as the cross strut **33** serves as a handle. As is shown in FIG. **1** the cross strut is desirably carried by upwardly protruding, lateral extensions **34** of the slidable rails **18, 19** so that the cross strut is disposed over the plane defined by said rails. This has the advantage that the tipping movement of the dirt container toward the emptying position shown in FIG. **1** is limited and that additional controls may be provided below the cross strut **33.** When the dirt container **2** is pivotally moved in the direction of the arrow **35,** its limiting position is determined by the cross strut **33.** The dirt container may be provided with a properly located extension serving as an abutment. The movement may be facilitated by a handle **36,** which is mounted on a wall of the dirt container.

As is shown in FIGS. **1** and **3,** the means for forcing the rim **14** of the dirt container **2** against the contact edge **13** comprise eccentric cams **37', 37,** which are rotatably mounted on the inwardly open slidable rails **18, 19** by means of bearings **38', 38.** The cams can be pivotally moved to protrude downwardly from the slidable rails **18, 19.** The slidable rails are open-bottomed adjacent to the cams, as is particularly apparent from FIG. **3.** The profile is designed so that the downward pivotal movement of the cams causes the lower rollers **22** and an additional roller **39** disposed near the outer end to be lifted from the lower roller tracks **17** and **40.** In the embodiment shown in FIG. **4,** the cam **37** is provided with an actuating lever **41.** Both cams may be separately actuated with such levers **41, 41',** which are disposed on both sides of the machine. The cams and particularly the levers are connected by a cross strut **42,** which permits of a simultaneous movement of the cams disposed on both sides in unison and which may be used as a handle for pulling out the dirt container. With reference to FIG. **3** showing the rear end of the retracted slidable rail **19,** the lever **41** must be turned in the clockwise sense in this case so that the cross strut and handle **42** would be pivotally moved rearwardly out of the vehicle body at the same time whereas said strut is otherwise contained in a recess in the vehicle body and held between the extensions **34.** The cross strut **33** between the two slidable rails **18, 19** is disposed on such a high level that the actuating levers **41, 41'** and the cross strut **42** connecting them can be pivotally moved under the cross strut **33.**

The cams have a portion **43** which is engageable with the lower roller track **40** and which has such an angle of lead that the cam is self-locking. The engaging portion **43** may be roughened. To automatically lock the retracted dirt container **2** in position, the point of support **44** is most preferably offset in the direction of the extending movement from a vertical line extending through the axis of the bearing **38.** This offset is indicated at **45** in FIG. **3.** FIG. **3** shows another desirable feature which resides in that the cam is relieved adjacent to the point of support in such a manner that it moves through a dead center to the position shown in FIG. **3.** In this case the elastic seal at the contact edge **13** must be compressible to such an extent that the seal can take up the ascent which is due to the movement through the dead center and which is succeeded by a certain descent and that this will not eliminate the sealing effect.

Owing to the pivotal suspension of the dirt container **2,** the narrow edge **14** which defines the opening of the container can be uniformly pressed against the seal **47** throughout the periphery of the container.

As is apparent in FIG. **4,** at least one slideway member **48** is mounted on the inside of the vertical wall portion **49** of the frame section member **20.** This slideway member serves as a lateral guide for the slidable rails and is disposed on the outside of the slidable rails **18, 19.**

Such slideway member is indicated in dotted lines in FIG. **2.**

What is claimed is:

**1.** A sweeping machine comprising a wheeled chassis, a downwardly open brush housing mounted on the chassis, a cylindrical brush rotatably mounted in the brush housing, a dirt container, which is detachably connected to the brush housing, frame section members extending along the chassis on both sides thereof, carriers which are slidably guided in said frame section members in the longitudinal direction thereof, and bearing means pivotally connecting said dirt container to said carriers.

**2.** A sweeping machine as set forth in claim **1,** in which said frame section members at least at one end are inwardly open and comprise vertical wall portions and transversely extending top and bottom roller tracks, the carriers consist of slidable rails, each of which is provided with at least two rollers, one of said rollers associated with each slidable rail is an end roller disposed at the inner end of the slidable rail and protrudes above said rail, and said rollers associated with each slidable rail except for said end roller are spaced from said end roller and protrude below said slidable rail.

**3.** A sweeping machine as set forth in claim **2,** in which each of said frame section members is an inwardly open channel.

**4.** A sweeping machine as claimed in claim **2,** in which each roller track for a downwardly protruding roller is provided with a detent recess arranged to receive said roller when the slidable rail is in an extended position.

**5.** A sweeping machine as claimed in claim **2,** in which the outer ends of the slidable rails are rigidly

connected by a cross strut, which forms a handle for a carrying structure comprising both slidable rails, and said cross strut is located to form a stop which is engageable by the pivoted dirt container in emptying position.

**6.** A sweeping machine as claimed in claim **1,** in which the bearing means comprise trunnions carried by said dust container on opposite sides thereof and open-topped bearing recesses provided in the carriers, said trunnions being rotatably mounted in and upwardly removable from said bearing recesses.

**7.** A sweeping machine as set forth in claim **1,** in which said chassis comprises a contact edge, which conforms to an edge defining an opening of the dirt container and is provided with a continuous peripheral seal, said edge of said dirt container is adapted to be forced against said seal, lifting means are provided at the outer ends of the carriers and are supported at their other end in the chassis and in a lifting position lift the outer ends of the carriers together with the bearing means for the dirt container and force said edge of the container against said contact edge.

**8.** A sweeping machine as set forth in claim **7,** in which said lifting means comprise eccentric cams, levers for actuating said cams, and pivot pins pivotally connecting said cams to the outer end portions of the carriers, said cams cooperating with outer end portions of the lower roller tracks and being pivotally movable below the plane which is defined by the rollers protruding below the carriers.

**9.** A sweeping machine as set forth in claim **8,** in which the cams have a peripheral portion which is engageable with the lower roller tracks for the carriers when the latter are to be lifted and is relieved at such an angle that the contacting surface portions of the cams and roller tracks are in self-locking engagement.

**10.** A sweeping machine as set forth in claim **8,** in which the peripheral surfaces of the cams are so shaped relative to their axes of rotation that imaginary vertical lines extending through the axes of rotation of the cams onto the roller tracks supporting said cams precede in the direction of the retracting movement of the carriers the point of support of the cams moved to lift the carrier, and the cams have at their periphery a radially relieved portion adjacent to the point of support.

**11.** A sweeping machine as set forth in claim **8,** in which cams mounted on both carriers are interconnected by a cross strut, which forms a handle for moving the cams and for pulling the carriers connected by said cross strut.

* * * * *