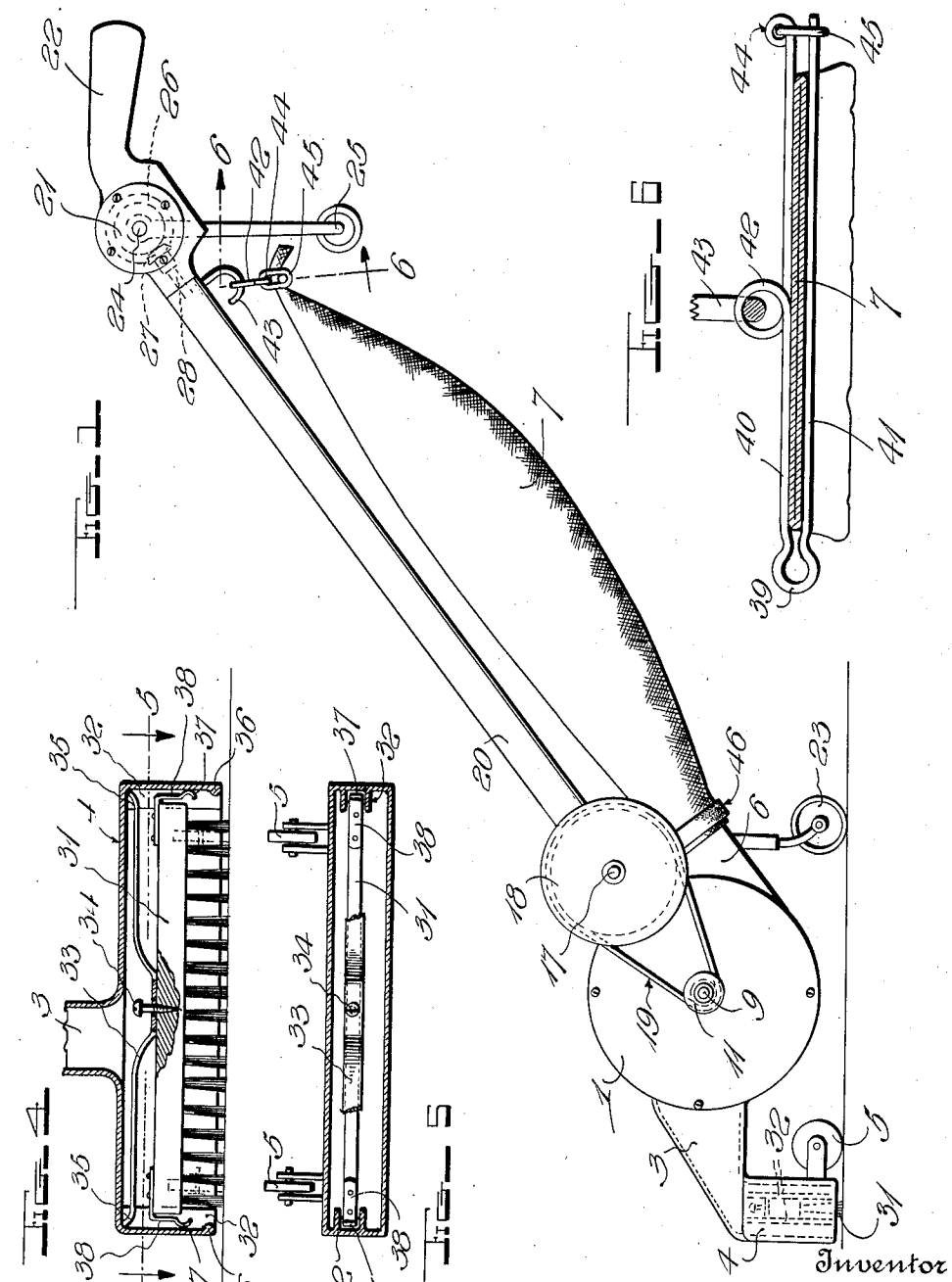
April 14, 1925. 1,533,919

W. L. KEEFER

HAND OPERATED VACUUM CLEANER

Filed Feb. 26, 1923 2 Sheets-Sheet 1



Witness

Inventor

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2 Sheets-Sheet 2

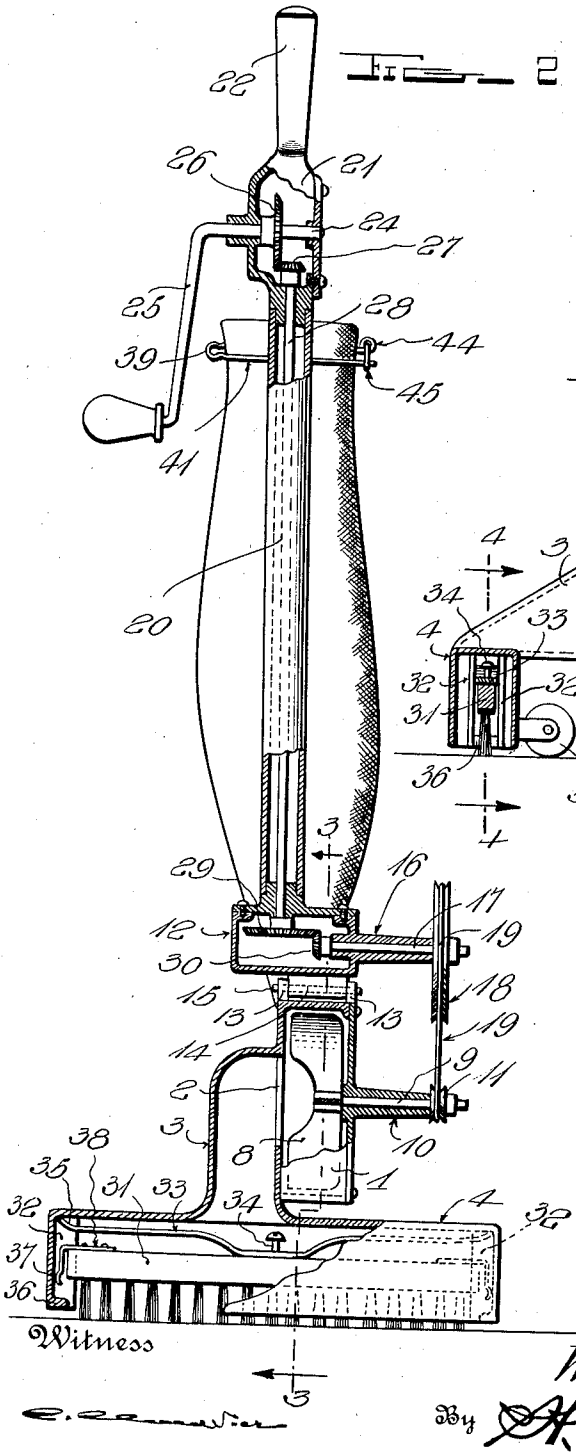


FIG. 2

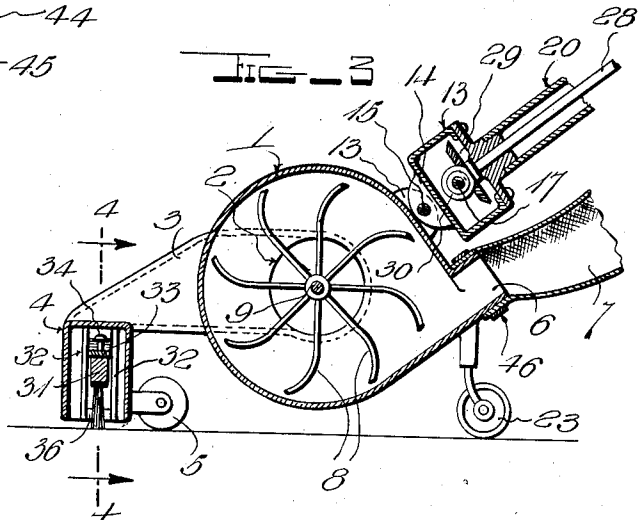


FIG. 3

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UNITED STATES PATENT OFFICE.

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HAND-OPERATED VACUUM CLEANER.

Application filed February 26, 1923. Serial No. 621,405.

To all whom it may concern:

Be it known that I, WALTER L. KEEFER, a citizen of the United States, residing at Chambersburg, in the county of Franklin and State of Pennsylvania, have invented certain new and useful Improvements in Hand-Operated Vacuum Cleaners; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in vacuum cleaners of the hand-operated type and has for its principal object to provide a simple and inexpensive device of this character which may be operated with ease, by holding the handle with one hand and turning a hand crank with the other, the device being greatly simplified and generally improved over similar devices heretofore provided.

A further object of the invention is to provide unique mounting means for a non-rotatable brush which is located in the suction nozzle.

A still further object is to provide a novel form of clamp for closing the rear end of the dust bag and supporting the same.

With the foregoing in view, the invention resides in the novel subject matter hereinafter described and claimed, the description being supplemented by the accompanying drawings.

Figure 1 is a side elevation.

Figure 2 is a longitudinal sectional view partly in elevation.

Figure 3 is a detail vertical longitudinal sectional view as indicated by line 3—3 of Fig. 2.

Figure 4 is a vertical transverse sectional view as indicated by line 4—4 of Fig. 3.

Figure 5 is a horizontal sectional view on line 5—5 of Fig. 4.

Figure 6 is a detail vertical transverse section on line 6—6 of Fig. 1.

In the drawings above briefly described, the numeral 1 designates a comparatively flat circular fan casing disposed in a vertical plane and having an inlet opening 2 in one of its flat vertical sides, which opening communicates with the neck 3 of a horizontally elongated transversely extending suction nozzle 4, this nozzle being provided with appropriate supporting rollers 5. At its lower portion, the casing 1 is formed with an outlet neck 6 discharging into and suitably connected with a dust bag 7.

A suitable suction fan 8 is rotatably mounted in the casing 1 and is provided with a carrying shaft 9 which extends laterally from said casing through an appropriate bearing 10 with which the latter is provided, the outer end of said shaft 9 being provided with a grooved pulley 11.

Behind the casing 1 and pivoted thereto on a transverse horizontal axis, is a small gear casing 12, the pivotal connection between the two casings being preferably established by providing the casing 1 with a pair of spaced ears 13, forming a lug 14 on the front side of the casing 12 for reception between said ears, and passing a pivot pin 15 through the ears and lugs. This construction establishes a laterally rigid but vertically pivoted connection between the two casings.

One side of the casing 12 is provided with a laterally extending bearing 16 behind and parallel with the bearing 10, and a second transverse horizontal shaft 17 is rotatably mounted in said bearing 16, the outer end of said shaft 17 being provided with a relatively large grooved pulley 18. An elastic belt 19 is trained around the pulleys 18 and 11 for driving the latter from the former and for permitting vertical movement of the gear casing 12 with the operating handle described below, without interfering with proper driving of the fan. Furthermore, when the handle is raised so that the shaft 17 is above a line intersecting the pivot pin 15 and the shaft 9, the elasticity of the belt 19 will pull forwardly to some extent on the shaft 17 thus serving to support part of the weight of the handle, which is obviously desirable.

The handle is designated by the numeral 20, this handle being of tubular form and being secured at its front end to the rear side of the gear casing 12. The rear end of the handle 20 carries a second gear casing 21 which is provided with a rearwardly extending hand grip 22 to be used in pushing and pulling the cleaner over the floor, there being very little weight to be supported by this hand grip however, due to the fact that the elastic belt 19 has under certain conditions a tendency to support part of the weight of the handle 20, and the entire

weight of the casing 1 and directly associated parts, is carried by the rollers 5 and a suitable caster 23 which may well be disposed under the outlet neck 6 of the fan casing 1.

A short transverse shaft 24 extends across the gear casing 21 and is provided on one end with a hand crank 25 to be turned with one hand of the operator while holding the hand grip 22 with the other hand. The shaft 24 is provided with a bevel gear 26 which meshes with a bevel pinion 27 on the rear end of the longitudinal shaft 28, the latter being rotatably mounted in the tubular handle 20 and having on its front end a bevel gear 29 meshing with a pinion 30 on the shaft 17. As the handle 20 and the gear casing 12 have no relative movement, the gears 29 and 30 will be in proper mesh at all times and due to the elastic belt 19, it will be seen that the handle 20 may be moved vertically to any desired position, without interfering in any manner with proper driving of the fan 8. The grip 22 and the crank 25 may be very conveniently held simultaneously and by rotating said crank rather slowly, sufficient speed will be imparted to the fan 8, on account of the ratio existing between the gears 26 and 29 and their respective pinions 27 and 30, and the relative sizes of the pulleys 18 and 11.

Preferably used in the nozzle 4, is a non-rotatable brush 31 whose back is vertically guided between parallel flanges or the like 32 formed on the inner surfaces of the nozzle ends. This brush is constantly forced down gently by a spring 33 which is preferably formed of a single strip of spring metal having its central portion depressed and connected loosely with the brush back as indicated at 34, the ends of said spring being preferably turned upwardly to some extent as indicated at 35 to contact with the upper side of the nozzle or with any other stationary internal portions thereof.

The end walls of the nozzle 4 are formed with internal rounded stops 36 co-operable with similar stops 37 carried by the back of the brush 31, the last named stops being in most instances formed by bending the ends of springs 38 which are secured to the brush back. Other arrangements however could be employed whereby the stops carried by the brush are inwardly yieldable but are normally forced outwardly to co-operate with the stops 36. Thus, while accidental dropping the brush from the nozzle is prevented, it will be seen that when said brush is pulled downwardly, the stops 37 will snap past the stationary stops 36, permitting the brush and the spring 33 to be totally or partially removed, as occasion may require.

In connection with the dust bag 7, I preferably provide the combined clamp and hanger detailed in Fig. 6, for the purpose of closing the rear end of said bag and for supporting it properly beneath the handle 20. This clamp and hanger is formed from a single length of spring wire bent upon itself at the point 39 to provide a pair of parallel clamping arms 40 and 41, the central portion of the arm 40 being bent to form an eye 42 for engagement with the supporting hook 43 which depends from the handle 20. The free end of one of the arms is bent to form an eye 44 for pivotally holding a link 45 which swings over the free end of the other arm, thus normally holding the two arms in clamping relation with the bag. By simply disengaging the link 45, the rear end of the bag may be opened for dumping its contents and if desired, the entire bag may be removed from the neck 6, for which purpose, the front end of said bag may have an elastic portion 46 snugly, yet removably surrounding the neck 6.

By employing the construction shown, or a substantial equivalent thereof, a cleaner is provided which may be simply and inexpensively manufactured and placed upon the market at a minimum price, yet it will be highly efficient and in every way desirable.

Attention is directed to the fact that the drive shaft 17 is in rear of the handle pivot 15 and that the elastic belt 19 engaged with the pulleys 11 and 18, exerts a constant forward pull on said shaft 17. Thus, when the handle 20 is swung upwardly until the gear casing 13 strikes the fan casing 1, the forward pull of the belt 19 will hold said handle in its raised position, which is of obvious advantage when the handle must be released, either before completing a cleaning operation, or after completion of such operation, when the device is to be set at some out of the way point. When the handle 20 is in an inclined operative position, the shaft 9, pivot 15 and shaft 17, are substantially on dead center as shown in Fig. 3, and thus the forward pull of the belt 19 is resisted, so that the handle 20 does not have a continual tendency to fly upwardly. If this handle is raised slightly above dead center, the forward pull of the belt assists in sustaining the weight of said handle and the parts carried thereby. These parts are so lightly constructed however, that their weight is insufficient to tire the operator, even if she does not avail herself of the opportunity of having the belt 19 assist in supporting such weight.

As excellent results may be obtained from the details disclosed, these details may be followed if desired. However, within the scope of the invention as claimed, numerous minor changes may be made.

I claim:

1. A hand-operated vacuum cleaner com-

prising a fan casing having an inlet nozzle at its front side, a suction fan in said casing having a horizontal shaft extending laterally through one side thereof, a gear casing pivoted to the rear side of said fan casing on a horizontal axis parallel to said shaft, a second horizontal shaft extending through one side of said gear casing and disposed parallel to and behind the fan shaft, wheels on both of said shafts and a belt trained around said wheels, said belt being yieldable to permit vertical swinging of said gear casing without interfering with driving of the fan shaft, an elongated handle at right angles to said shafts secured at its front end to said gear casing, a longitudinally extending manually operated shaft carried by said handle and extending into said gear casing, and gearing in said gear casing for driving the second named shaft from said longitudinal shaft.

2. A vacuum cleaner comprising a fan casing having a nozzle, a fan in said casing having a transverse horizontal shaft extending laterally therefrom and provided with a pulley, a gear casing pivoted to said fan casing on a transverse horizontal axis behind said fan shaft, said gear casing being adapted to engage the fan casing when swung forwardly on its pivotal connection, a handle fixed on said gear casing, a transverse horizontal drive shaft mounted in said gear casing in rear of the pivotal connection thereof with said fan casing, said drive shaft having a pulley, an elastic belt trained around both of said pulleys and exerting a constant forward pull on the second named pulley and the gear casing carrying the handle whereby when the handle and gear casing are swung forwardly and the latter engaged with the fan casing, the handle will be held in a vertical position, and means on the handle for driving said drive shaft.

3. A structure as specified in claim 1; the two horizontal shafts and the handle pivot being disposed substantially on dead center when the handle is in an inclined operative position.

In testimony whereof I have hereunto affixed my signature.

WALTER L. KEEFER.