June 22, 1965 B. DANEMAN 3,189,932

STREET CLEANING APPARATUS

Filed March 22, 1963 4 Sheets-Sheet 1

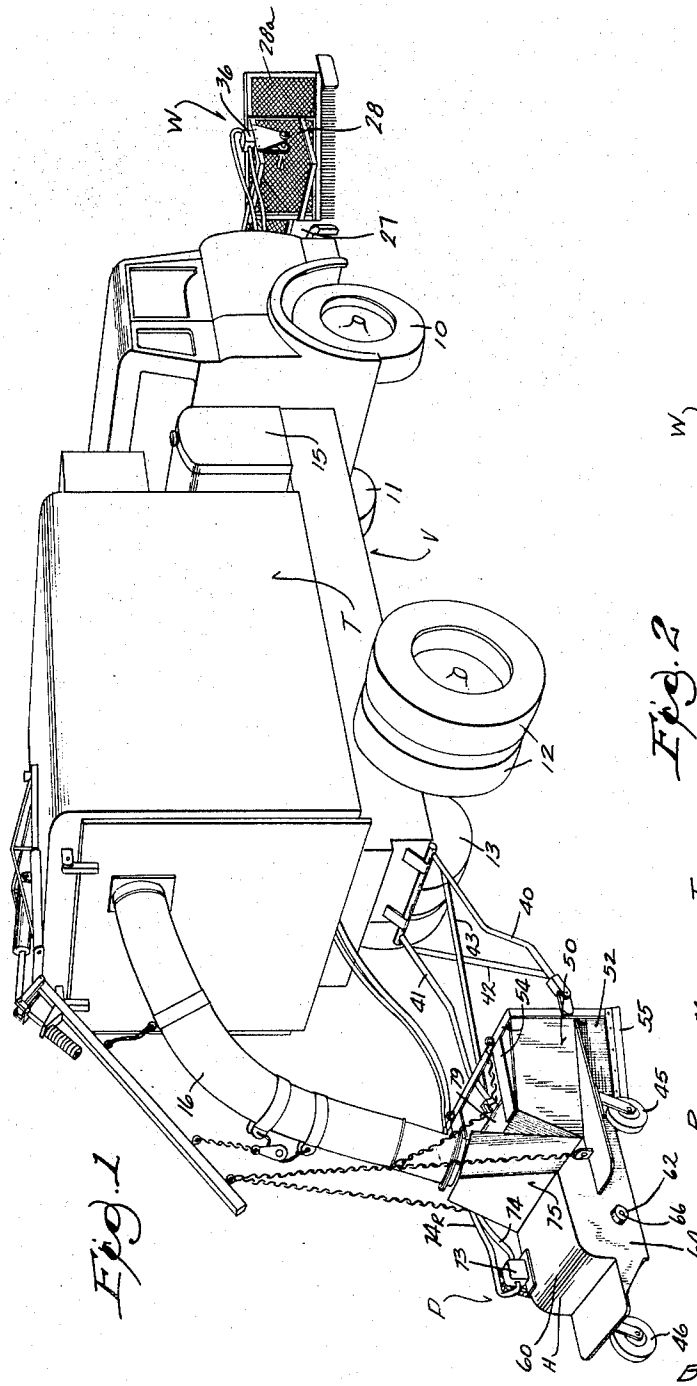


Fig. 1

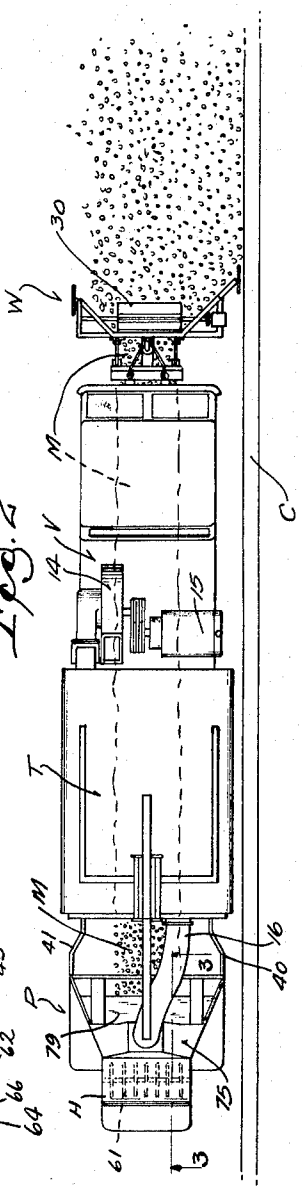


Fig. 2

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BY

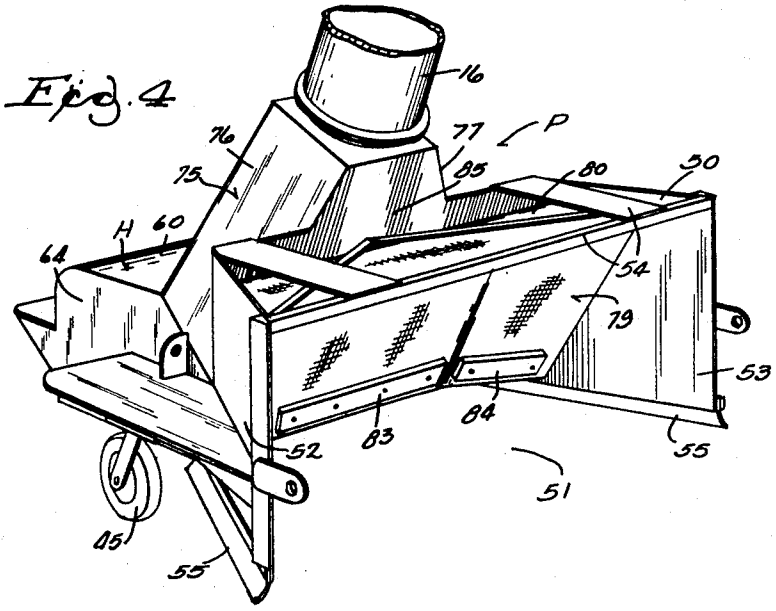
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ATTORNEYS

June 22, 1965 B. DANEMAN 3,189,932

STREET CLEANING APPARATUS

Filed March 22, 1963 4 Sheets-Sheet 2

Fig. 4



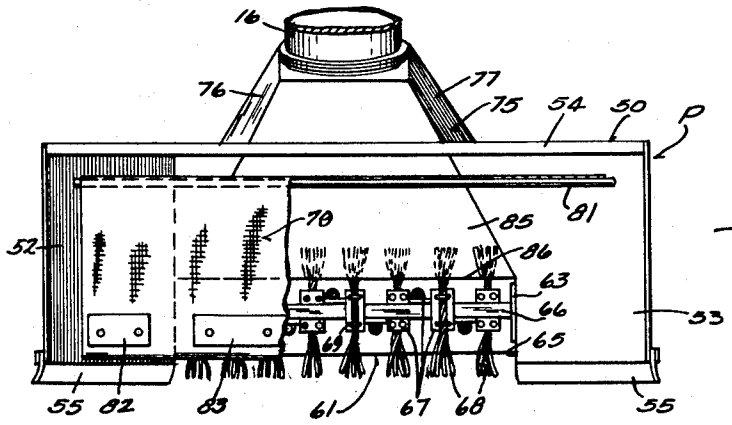


Fig. 5

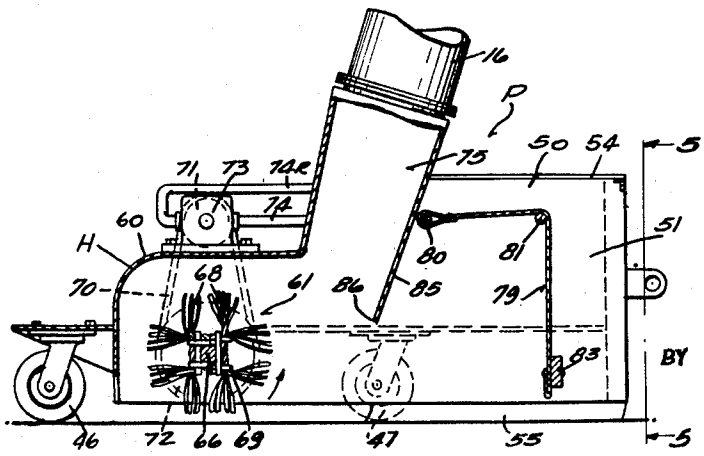


Fig. 3

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June 22, 1965 B. DANEMAN 3,189,932

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Filed March 22, 1963 4 Sheets-Sheet 3

Fig. 6

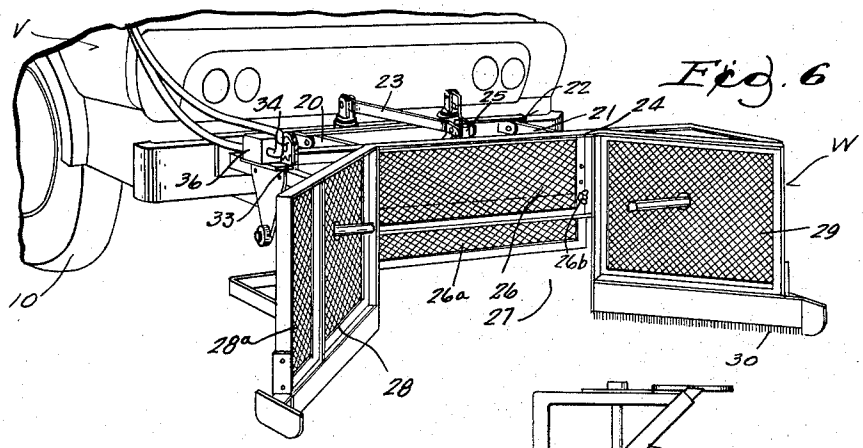
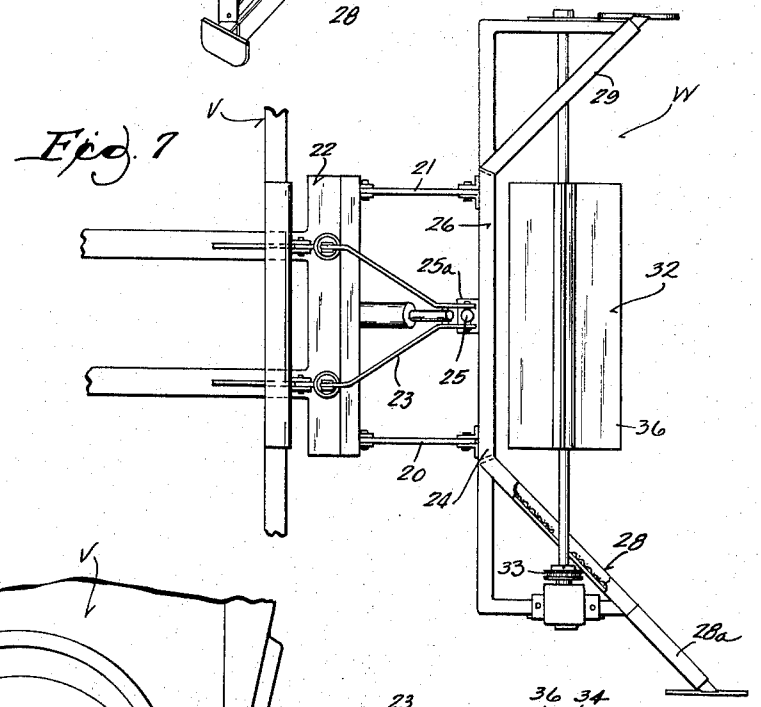


Fig. 7



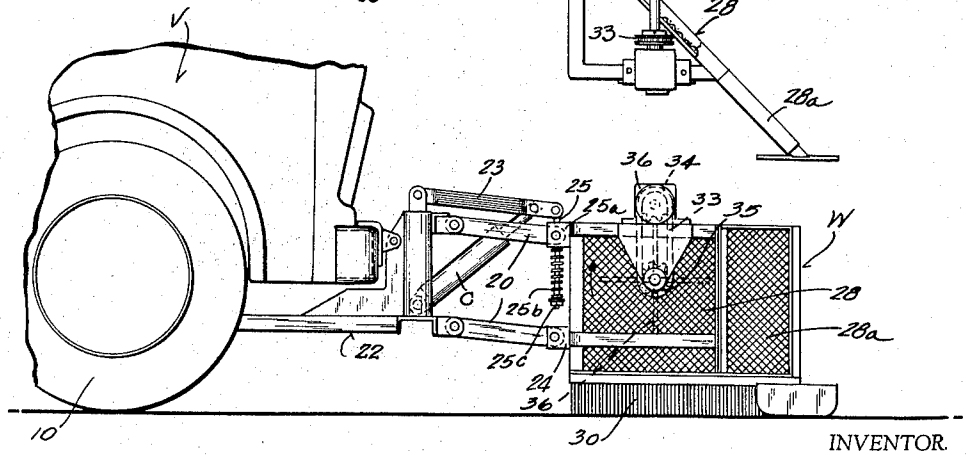


Fig. 8

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June 22, 1965 B. DANEMAN 3,189,932

STREET CLEANING APPARATUS

Filed March 22, 1963 4 Sheets-Sheet 4

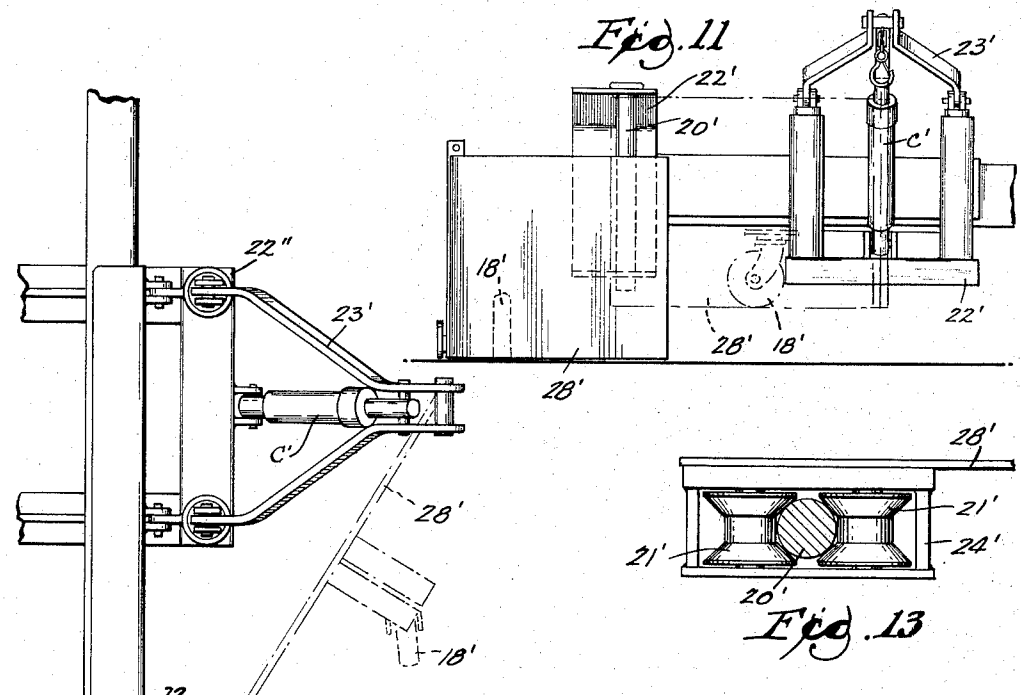


Fig. 9

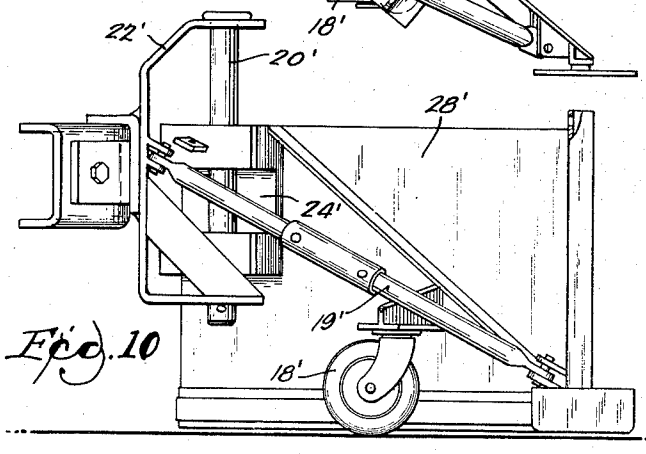


Fig. 10

Fig. 11

Fig. 13

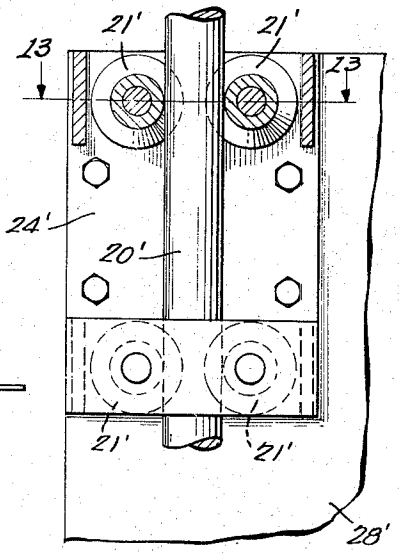


Fig. 12

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United States Patent Office 3,189,932 Patented June 22, 1965

3,189,932

STREET CLEANING APPARATUS

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Filed Mar. 22, 1963, Ser. No. 267,108
6 Claims. (Cl. 15—340)

This invention relates generally to street cleaning apparatus and finds particular though not exclusive utility in collecting leaves or the like.

Vacuum type devices of the character with which the present invention is used have heretofore been proposed and used with some degree of success. Various devices of the prior-art types have utilized suction nozzles, either with or without enclosing hoods or cooperating brushes or beaters. Other devices have attempted to combine into a single unit the functions of wind-rowing and pick-up.

These prior devices have certain shortcomings, however, such as the lack of ability to gather and control the large volume of relatively light-weight material, such as leaves, encountered in these operations. This material may sometimes be quite wet or mixed with branches or like material which further contributes to difficulty in gathering and picking it up. Other shortcomings are poor visibility for the operator of the vehicle and his lack of "feel" as to the proper relative position of the pick-up unit to the material.

A general aspect of the present invention is to provide street cleaning apparatus which overcomes the above deficiencies of prior-art devices.

More particularly, the present invention provides street cleaning apparatus which forms and directs a windrow of material so that it is not run over by the tractive vehicle and can be efficiently and completely picked up. This is accomplished while affording the driver-operator good visibility and complete "feel" and "sense" as to the operation and location of the various parts of the apparatus, in respect to the material being picked up.

Another aspect of the present invention is to provide an improved windrower unit which gathers the material and forms it into a controlled windrow. This unit forms the windrow centrally between the wheels, and before the latter have a chance to run over and compress the material. Furthermore, this unit sweeps the traversed area clean and can closely follow undulating contours of the street. This aspect of the invention further contemplates adjustable means for controlling the height of the windrow so formed, and also has agitator means for insuring proper and continuous formation and discharge of the windrow regardless of the inclusion of material such as tree branches which may be present.

Still another and important aspect of the present invention relates to an improved vacuum collecting or pick-up unit which is particularly effective and efficient in completely gathering, retaining, and picking up all material into which it is driven.

These and other objects and advantages will appear hereinafter as this disclosure progresses, reference being had to the accompanying drawings, in which:

FIGURE 1 is a perspective view, taken from the right, rear side, of apparatus embodying the present invention;

FIGURE 2 is a plan view of the apparatus shown in FIGURE 1, but on a reduced scale and more or less schematic in form;

FIGURE 3 is a sectional view taken along line 3—3 in FIGURE 2, but on an enlarged scale;

FIGURE 4 is a perspective view, on an enlarged scale, of the pick-up unit shown in FIGURE 3, taken generally from the right, front side thereof;

FIGURE 5 is a front elevational view of the pick-up unit shown in FIGURE 3 and taken generally from line

5—5 thereof, but with parts shown in section, broken away or removed for clarity in the drawings;

FIGURE 6 is a perspective view, taken generally from the front, right side, of the windrower shown in FIGURES 1 and 2, but on an enlarged scale;

FIGURE 7 is a plan view of the windrower shown in FIG. 6;

FIGURE 8 is a side elevational view of the windrower;

FIGURE 9 is a plan view of a somewhat modified single blade windrower illustrating the foldability of the blade by means of dot-and-dash lines;

FIGURE 10 is a side elevational view of the windrower of FIG. 9;

FIGURE 11 is a front elevation thereof;

FIGURE 12 is a somewhat enlarged section taken along the line 12—12 of FIG. 9; and

FIGURE 13 is a transverse section along the line 13—13 of FIG. 12.

General

The general organization includes a self-propelled, vacuum-type debris collector vehicle V of the type shown in my U.S. Patent No. 3,052,908, issued September 11, 1962, entitled "Vacuum-Type Debris Collector." Reference may be had to that patent if a complete description of the structure and operation of the vehicle is deemed to be either necessary or desirable. It is believed sufficient to say for purposes of this disclosure, however, that this vehicle includes front ground wheels 10, 11 and rear dual wheels 12 and 13, a large enclosed tank T, a high pressure blower 14 driven by an internal combustion engine 15 which draws a vacuum from the tank, and a large suction nozzle or conduit 16 that extends rearwardly from the tank.

Attached to the front of the vehicle V and extending forwardly therefrom is an improved windrower W.

A pick-up unit P is attached to and extends rearwardly from the rear end of the vehicle and serves to pick up the windrow of material M which is formed by the windrower W and over which the vehicle passes.

The entire organization is arranged preferably in a straight line, as shown in FIGURE 2, and sufficient room is provided for the units W and P which as a result may be of considerable size. This particular arrangement provides that the area adjacent the curb C or other obstacles can be completely cleaned up, and without hindering the normal flow of traffic. Other arrangements of the units could be employed, such as to the side of the truck, or the unit P could be mounted midships or even directly behind the windrower, but the arrangement shown has proven to be particularly desirable for the reasons indicated.

Windrower

The windrower W is pivotally attached to the front end of the vehicle by the two pairs of parallel arms 20 and 21. The rear ends of these arms are pivotally attached to a mounting frame 22 rigidly secured to the front end of the vehicle, and the front ends of these arms are pivotally attached to the rear side of an angle iron frame 24 of the windrower.

A lifting yoke 23 is pivotally attached at its rear end to the frame 22 and a rod 25 is pivotally connected at its upper end to the front end of yoke 23. This rod 25 extends downwardly and loosely through a block 25*a* welded to the rear side of the frame 24. A spring 25*b* is slipped over the lower end of the rod 25 and is held captive thereon by a pin 25*c* which extends through the lower end of the rod. The spring thus reacts between the block 25*a* and the lower end of the rod.

A hydraulic cylinder unit C acting between the mounting frame 22 and the yoke 23 acts to raise and lower the

windrower, maintaining it in the same attitude relative to the ground because of the upper pair of arms 20 which are parallel to the lower pair of arms 21. The cylinder unit is used for shifting the windrower between a raised transport position and a lowered working position in which the weight of the windrower is resiliently cushioned or carried by the partially compressed spring 25*b*. In this lowered position, the brush means 30 (to be referred to later) may rest lightly on the ground for good sweeping engagement therewith, but the windrower is free to rise a limited amount in the event it strikes an obstacle. With this mounting the windrower is cushioned by the spring which supports most of its weight and "floats" in light sweeping engagement with the ground.

The windrower frame 24 is of generally U-shape in form when viewed in plan and has its open front end facing forwardly in respect to the direction of travel whereby material is forced into the windrower. The frame includes a generally vertical rear wall 26 having a discharge opening 27 formed in its lower portion. The frame also includes a pair of generally vertical side walls 28 and 29 which diverge forwardly from the rear wall. These side walls each have ground contacting means in the form of the previously mentioned brush means 30 fixed to and extending along their lower edges and which are in light contact with the street to be cleaned.

Because of the parallel linkage arms between the windrower and the vehicle, the brush means ride on the ground regardless of the irregularities thereof. This linkage is sufficiently flexible from one side of the frame to the other to also permit the windrower to adapt to traverse undulations in the street contour.

As the windrower moves along, the brush means 30, because of their angle to the direction of travel, sweep the material toward the center of the windrower, and this together with the inclined side walls 28 and 29, act to urge the gathered material rearwardly against the rear wall 26 and out of the opening 27.

The height of the windrow of material so formed is determined by the height of the opening 27, which opening may be varied by the baffle 26*a* which can be vertically positioned over the opening by bolt means 26*b*. In this manner, depending on the general amount, condition or variation in amount of the material along the street, the windrow size may be adjusted and averaged out as the apparatus moves along, thereby promoting even and efficient feeding to the pick up unit P, to be described presently.

Agitator means may be provided in the windrower for insuring continual discharge of the material through the opening if the presence of certain material, such as tree branches, requires it. The agitator means may take the form of a rotary beater 32 mounted on the side walls 28 and 29, and driven by the endless belt 33 and suitable pulleys 34 and 35 from a conventional hydraulic motor 36 mounted on the collector. As the beater rotates in the direction indicated by the arrow in FIGURE 8, the paddles 36 act to force or push the material through the discharge opening to prevent blocking or build up of material in or just ahead of this opening.

The side wall 28 includes an extension 28*a* by means of which the windrower can move closely adjacent to the curb for complete cleaning of the gutter.

The windrower W′ of FIGURES 9 to 12 has only a single wall or blade 28′ pivotally attached to the front end of the vehicle for swinging movement from a ground engaging position in which the blade is inclined inwardly from front to rear in the direction of movement of the vehicle and wherein the blade traverses the area in advance of the wheel 10 to a raised and inoperative position ahead of the vehicle bumper as illustrated by dot-and-dash lines in FIGURE 9.

In this modified device, the front end of the vehicle has a pivot bracket 22′ rigidly secured thereto and this bracket 22′, in turn, carries a vertical pivot pin or post 20′. Secured to the rear of the blade is a rigid bracket 24′ which has spaced pairs of peripherally grooved rollers 21′ engaging the post 20′ for vertical movement therealong. A strut or arm 19′ is connected between the rear of the blade 28′ near the lower front corner thereof and the bracket 22′, and when this strut is thus connected as shown in FIGURES 9 and 10, the windrow blade is maintained in its effective ground engaging position but is permitted to rise and fall to a limited extent over undulations by reason of the coaction between the rollers 21′ and post 20′, coupled with the play in the relatively loose connections at the opposite ends of the strut 19′.

However, the strut 19′ may be disconnected when it is desired to render the windrower blade inactive, and the blade 28′ may then be swung about the post 20′ to the dot-and-dash position in FIGURE 9 wherein it may be lifted by means of a lifting yoke 23′ and a hydraulic cylinder C′ both pivotally mounted on a frame 22″ secured at the forward end of the vehicle. When the blade 28′ is raised by the hydraulic cylinder C′ and yoke 23′, the strut 19′ may again be connected between the bracket 22′ and blade 28′ and the windrower is inactive until lowered and swung again to its full line position.

The blade 28′ may, of course, be provided with a depending brush or flexible wiper, and a curb engaging guide plate may be provided at the lower front edge. Also, it is preferable to provide the blade 28′ with a caster wheel 18′ as shown so that the blade will ride easily over the ground and any undulations therein. The blade 28′ thus guides and windrows debris toward the center of the vehicle between the wheels thereof.

Pick-up unit

The pick-up unit P is pulled along the rear of the vehicle by a pair of arms 40 and 41 which are pivotally attached at their forward ends to the vehicle and at their rear ends to the unit P. Cross braces 42 and 43 welded between the arms 40 and 41 prevent transverse swinging of the unit and insure its continual alignment with the windrow M formed centrally between the wheels of the vehicle. Thus the unit is free to rise and fall relative to the vehicle and permit its ground wheels 45, 46 and 47 to freely follow the contour of the ground and maintain the unit at a constant attitude to the ground.

The pick-up unit includes an enclosed hood H fabricated from sheet steel and having a forwardly extending portion 50 that terminates at its forward end in a debris receiving opening 51. More particularly, portion 50 is comprised of a pair of side walls 52 and 53 which diverge forwardly and have connecting frame members or braces 54 therebetween. Portion 50 is open at its bottom side and ground-engaging flexible wipers 55 are secured along the lower edges of walls 52 and 53 to retain the material within the hood as the latter is drawn over the windrow. The large, forwardly facing opening 51 permits complete and ready entry of the windrow into the hood.

Arranged transversely across and within the rear portion 60 of the hood is a rotary beater 61 journalled in suitable, anti-friction bearings 62, 63 in the sides 64 and 65, respectively, of the rear portion. This beater may be of any suitable construction, but the form shown has proved to be particularly effective. This beater consists of a shaft 66 to which are welded the plates 67. Lengths of steel cables 68 are in turn secured to these plates by U-bolt clamps 69. As the beater is driven at high speeds through the endless belt 70 and pilleys 71 and 72, by the hydraulic motor 73 mounted on the top of the unit, it acts to flail, chew and churn the matted leaves, branches and curb-side debris and lifts this material off the street. This action acts to reduce the bulk of the material and enhances the suction effect of the conduit 16 which is in communication with the hood. The motor is driven by fluid pressure through conduits 74 and 74R connected with a source (not shown) of fluid pressure located on the vehicle.

The conduit 16 is connected to the top of the hood and is located directly behind the forwardly extending portion 50 and immediately in front of the beater. More particularly, a suction manifold 75 extends across the width of the upper side of the hood, is inclined forwardly and its sides 76 and 77 converge upwardly. The conduit then communicates with the upper end of the manifold. Much of the material, particularly the lighter and loose material, is fed directly to and is picked up by the conduit without being acted on by the beater.

To promote the suction effect of the conduit, the bottom edges of the rear portion 60 terminate a spaced distance above the ground providing an opening for air flow, and a flexible curtain 79 may or may not be extended across and within the forward portion 50 to reduce the amount of air sucked in from the front side of the hood. If provided, this curtain is fixed at its rear end to a rod 80 across the upper side of portion 50 and extends forwardly and then hangs over another transverse rod 81 fixed across the upper side of portion 50. Weights 82, 83 and 84 are fixed to the lower end of the curtain and act to hold it down on top of the material as it is dragged over the top thereof. Thus the curtain acts to spread the gathered debris while aiding in promoting good suction pick-up.

The front side 85 of the manifold extends downwardly within the hood and terminates at 86, thereby further limiting the entry of excess air, and together with the weighted curtain, controls the entry of material to the rear portion of the hood.

Résumé

The windrower having a rear discharge opening that controls the size of the windrow and locates the latter between the vehicle wheel, acts to evenly feed the material to the pick-up unit located behind it. The gathered material is not matted down by the truck wheels, and complete cleaning is possible close to the curb or other obstacles.

While the windrower and pick-up unit could be mounted otherwise on the vehicle for example, to the side, or both units up front, the arrangement shown provides sufficient room for sizeable units for good capacity. Also good visibility and maneuverability is possible with this arrangement.

The pick-up unit, with its forwardly facing, debris receiving opening completely picks up all the material without hesitation and pulverizes that portion of the material which requires it. The material is efficiently drawn from a central, upper portion of the substantially enclosed hood, all with relatively small horsepower requirements.

Various modes of carrying out the invention are contemplated as being within the scope of the following claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention:

1. A self-propelled street cleaning vehicle including a debris windrower comprising: linkage means between said windrower and the front end of said vehicle for permitting relative vertical movement therebetween, said windrower including a generally vertical rear wall having a discharge opening in the lower portion thereof, said windrower also including a pair of generally vertical side walls diverging forwardly from said rear wall, ground contacting means located along the lower edge of said side walls for contacting the area being traversed, whereby debris in said area is formed into a windrow by said side walls and passes through said discharge opening at a width and height determined by the size of said opening, and agitator means in said windrower forwardly of said rear wall and above said discharge opening out of contact with the ground for agitating the material in said windrower to insure continuous discharge of the material through said opening.

2. A street cleaning vehicle including a windrower as defined in claim 1, wherein means are also provided for varying the size of said discharge opening.

3. A street cleaning vehicle including a windrower as defined in claim 1, wherein means are additionally provided for raising said windrower to vertically position the same relative to said vehicle.

4. A street cleaning vehicle including a windrower as defined in claim 1 wherein the agitator is rotatably supported by the side walls.

5. A street cleaning vehicle including a windrower as defined in claim 4, wherein means are mounted on one of the side walls for rotating the agitator.

6. A street cleaning vehicle including a windrower as defined in claim 1, wherein a vacuum pick-up device is attached to the rear of the vehicle and has suction means for picking up the windrow of debris and conveying it to a tank on the vehicle.

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