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(54) Title: SURFACE TRACKING SWEEPING BROOM APPARATUS FOR USE WITH A VEHICLE

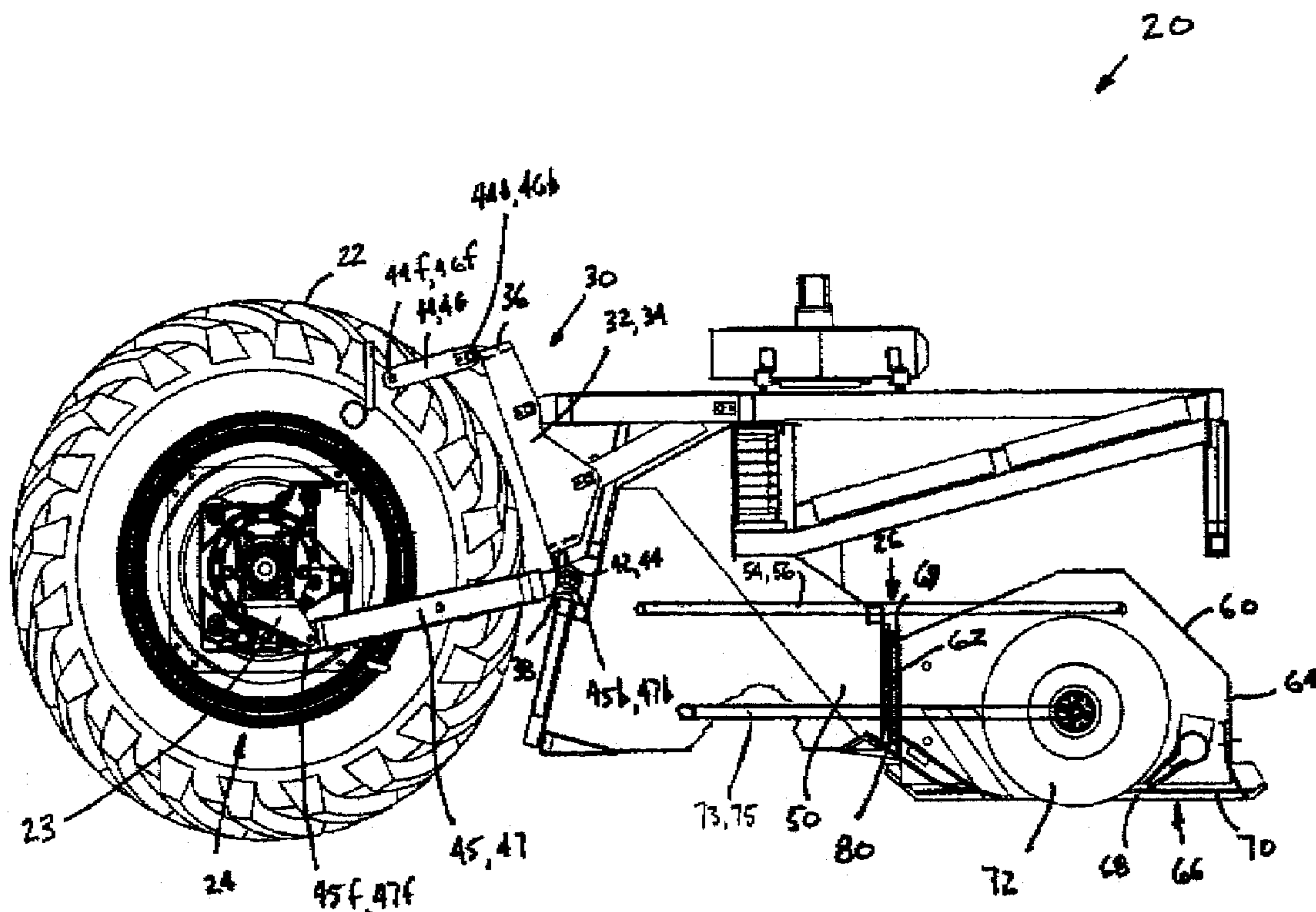


FIG. 1

(57) **Abrégé/Abstract:**

A sweeping broom apparatus comprises a main body having a debris receiving inlet, and connecting arms for operatively connecting the main body to a vehicle. A broom shroud has a forwardly facing debris outlet for permitting the directed egress of

(57) **Abrégé(suite)/Abstract(continued):**

debris therefrom as a forwardly propelled stream of debris. There are arms for mounting the broom shroud on the main body, for free vertical movement of the broom shroud with respect to the main body. A main sweeping broom is operatively mounted free vertical movement within the broom shroud for propelling debris forwardly from a surface being cleaned, thereby creating a stream of debris propelled forwardly through the forwardly facing debris outlet to a the debris receiving inlet of the vehicle. A dust-containing pliable cover is connected in substantially sealed relation to the broom shroud at the forwardly facing debris outlet and connected in substantially sealed relation to the vehicle at the debris receiving inlet for containing dust from the stream of debris propelled forwardly through the forwardly facing debris outlet.

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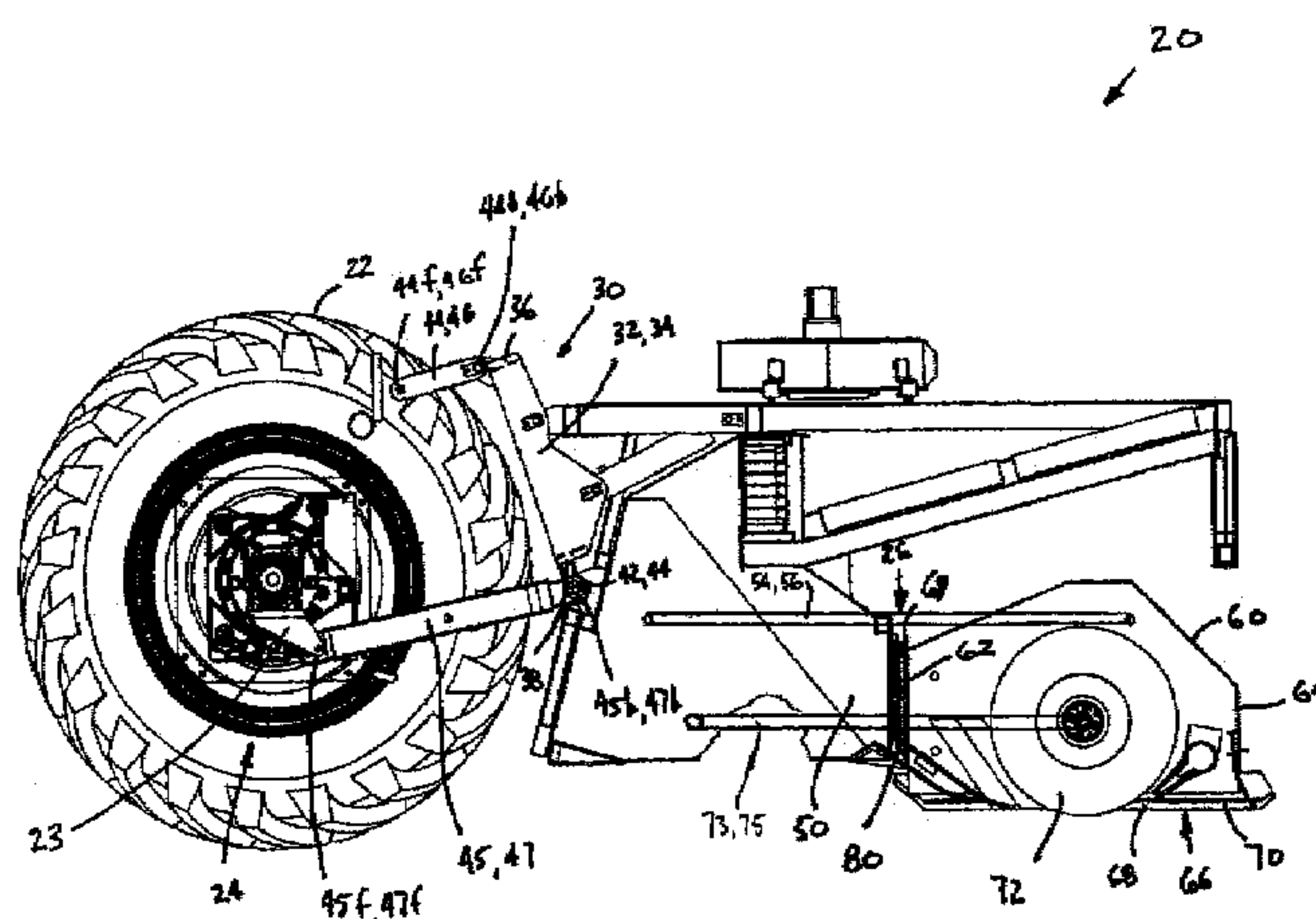


FIG.1

(57) Abstract: A sweeping broom apparatus comprises a main body having a debris receiving inlet, and connecting arms for operatively connecting the main body to a vehicle. A broom shroud has a forwardly facing debris outlet for permitting the directed egress of debris therefrom as a forwardly propelled stream of debris. There are arms for mounting the broom shroud on the main body, for free vertical movement of the broom shroud with respect to the main body. A main sweeping broom is operatively mounted free vertical movement within the broom shroud for propelling debris forwardly from a surface being cleaned, thereby creating a stream of debris propelled forwardly through the forwardly facing debris outlet to a the debris receiving inlet of the vehicle. A dust-containing pliable cover is connected in substantially sealed relation to the broom shroud at the forwardly facing debris outlet and connected in substantially sealed relation to the vehicle at the debris receiving inlet for containing dust from the stream of debris propelled forwardly through the forwardly facing debris outlet.

CANADA

TITLE: SURFACE TRACKING SWEEPING BROOM APPARATUS FOR USE
WITH A VEHICLE

INVENTOR: ROGER VANDERLINDEN

This application is a non-provisional application claiming priority from U.S. Provisional Patent Application Serial No. 60/975,029 filed on September 25, 2007, which is herein incorporated by reference.

FIELD OF THE INVENTION

[0001] The present invention relates to street sweeping vehicles, and more particularly to dustless street sweeping vehicles.

BACKGROUND OF THE INVENTION

[0002] Conventional street sweepers have a main vehicle body and a hopper supported by the main vehicle body. In mechanical type street sweepers, there is a debris elevator at the back end of the vehicle. A large cylindrically shaped rotating sweeping broom is disposed immediately behind the elevator. The large cylindrically shaped sweeping broom contacts the surface being cleaned so as to propel debris forwardly to the elevator. The debris elevator

receives debris from a main sweeping broom and deposits the debris into the hopper.

[0003] Similarly, for re-circulating types street sweepers and vacuum type street sweepers, a large cylindrically shaped sweeping broom is commonly used in conjunction with air flow to remove debris from a surface being cleaned.

[0004] Inevitably, the action of the rotating sweeping broom causes a large volume and flow of air laden with dust and other fine particulate material. Of particular concern is very fine particulate material such as "PM10" and "PM2.5", which refer to respirable particulate material or dusts with an average aerosol diameter of less than 10 microns or 2.5 microns, respectively. This fine particulate material is generally considered as a health risk to humans. It is well known that this fine particulate material can cause breathing problems, especially to more susceptible individuals, and the long term effects of breathing this fine particulate material can seriously affect one's health. Accordingly, legislation exists in many jurisdictions to preclude street sweepers and factory sweepers from emanating such fine particulate material during sweeping operations.

[0005] In prior art sweepers, in order to preclude the escape of dust and other fine particulate material from the broom area, the elevator, if present, and the hopper are shrouded. Additionally, the bottom of the shroud around the broom area and the bottom area of the elevator, have a series of rubber flaps depending from the shroud. The purpose of these flaps is to seal off the overall unit to the surface, in an attempt to preclude any dust and other fine particulate material from escaping to the ambient surroundings.

[0006] However, there is still a serious problem with prior art street sweepers and factors sweepers, due to the fundamental nature of their construction. The shroud around the broom and the elevator, where applicable, is substantially rigid. The sweeping broom is independently spring mounted for vertical movement within the shroud such that the sweeping broom can generally track most of the undulations in the surface being cleaned; however, the shroud around the broom does not move with the undulations in the surface being swept as it is rigid and is rigidly connected to the vehicle. Accordingly, the various flaps at the bottom edge of the broom shroud may separate from the surface being swept, thus permitting dust and other fine particulate material to be forcefully expelled from the sweeping apparatus in an undesirable manner, which is unacceptable, but until now unavoidable.

[0007] Further exacerbating the problem of dust and other fine particulate material being forcefully emanated from the sweeping apparatus, in some street sweepers, is the inclusion of an air blast nozzle immediately behind the broom. Such air blast nozzles are used to further clean the surface being swept either immediately behind the sweeping broom, or at the area of contact of the sweeping broom. The air expelled from the air blast nozzle increases the overall air pressure and air motion in the broom shroud, thus increasing the amount of dust and other fine particulate material that might be forcefully expelled from the sweeping apparatus. For such sweepers, there is an even greater need for a solution to this serious problem.

[0008] Moreover, this air laden with dust and other fine particulate material is suctioned into the hopper or debris elevator by the re-circulating air system of the street sweeper. However, in the case that the structure of the sweeping broom and the broom shroud around the sweeping broom are independently movable, at least in a vertical sense, with respect to the hopper or debris elevator, there is a physical separation between the broom shroud and the hopper or debris elevator. Accordingly, the air laden with dust and other fine particulate material can escape from between the broom shroud and the hopper or debris elevator,

which is unacceptable, or possibly even in contravention of legislation in many jurisdictions.

[0009] It is an object of the present invention to provide a dustless sweeping broom apparatus.

[00010] It is another object of the present invention to provide a dustless sweeping broom apparatus that precludes the egress of dust and other fine particulate material from the street sweeping vehicle.

[00011] It is a further object of the present invention to provide a dustless sweeping broom apparatus that precludes the egress of dust and other fine particulate material from the street sweeping vehicle, even when the broom and broom shroud are tracking undulations in the surface being cleaned.

[00012] It is another object of the present invention to provide a dustless sweeping broom apparatus, that precludes the egress of dust and other fine particulate material from the street sweeping vehicle, in the case that there is a physical separation between the broom shroud and the hopper or debris elevator.

[00013] It is another object of the present invention to provide a dustless sweeping broom apparatus, that precludes the egress of dust and other fine particulate material from the street sweeping vehicle, in the case that there is a physical separation between the broom shroud and the hopper or debris elevator, even when the broom and broom shroud are tracking undulations in the surface being cleaned.

SUMMARY OF THE INVENTION

[00014] In accordance with one aspect of the present invention there is disclosed a novel main body having a debris receiving inlet, and connecting means for operatively connecting the main body to a vehicle. A broom shroud has a front end, a back end, an open bottom defined by a bottom edge, and a forwardly facing debris outlet for permitting the directed egress of debris therefrom as a forwardly propelled stream of debris. There is means for mounting the broom shroud on the main body, for free vertical movement of the broom shroud with respect to the main body. An airflow obstructing means is disposed around the bottom edge of the broom shroud for substantially obstructing the egress of air from between

the bottom edge of the broom shroud and the surface being cleaned. A main sweeping broom is operatively mounted within the broom shroud for propelling debris forwardly from a surface being cleaned, thereby creating a stream of debris propelled forwardly through the forwardly facing debris outlet to the hopper. A dust-containing pliable cover is connected in substantially sealed relation to the broom shroud at the forwardly facing debris outlet and connected in substantially sealed relation to the vehicle at the debris receiving inlet for containing dust from the stream of debris propelled forwardly through the forwardly facing debris outlet.

[00015] In accordance with another aspect of the present invention there is disclosed a novel main body having a debris receiving inlet, and connecting means for operatively connecting the main body to a vehicle. A broom shroud has a front end, a back end, an open bottom defined by a bottom edge, and a forwardly facing debris outlet for permitting the directed egress of debris therefrom as a forwardly propelled stream of debris. There is means for mounting the broom shroud on the main body, for free vertical movement of the broom shroud with respect to the main body. An airflow obstructing means is disposed around the bottom edge of the broom shroud for substantially obstructing the egress of air from between the bottom edge of the broom shroud and the

surface being cleaned. A main sweeping broom is operatively mounted within the broom shroud for propelling debris forwardly from a surface being cleaned, thereby creating a stream of debris propelled forwardly through the forwardly facing debris outlet to the hopper. There is also means for mounting the main sweeping broom on one of the broom shroud and the vehicle, for free vertical movement of the main sweeping broom with respect to the broom shroud and the vehicle.

[00016] Other advantages, features and characteristics of the present invention, as well as methods of operation and functions of the related elements of the structure, and the combination of parts and economies of manufacture, will become more apparent upon consideration of the following detailed description and the appended claims with reference to the accompanying drawings, the latter of which is briefly described herein below.

BRIEF DESCRIPTION OF THE DRAWINGS

[00017] The novel features which are believed to be characteristic of the sweeping broom apparatus according to the present invention, as to its structure, organization, use and method of operation, together with further objectives and

advantages thereof, will be better understood from the following drawings in which a presently preferred embodiment of the invention will now be illustrated by way of example. It is expressly understood, however, that the drawings are for the purpose of illustration and description only, and are not intended as a definition of the limits of the invention. In the accompanying drawings:

[00018] Figure 1 is a partially cut-away left side elevational view of the first preferred embodiment of the sweeping broom apparatus according to the present invention, connected to a vehicle, specifically a tractor;

[00019] Figure 2 is an enlarged partially cut-away left side elevational view of the first preferred embodiment of the sweeping broom apparatus of Figure 1, mounted on a tractor; and,

[00020] Figure 3 is a partially cut-away left side elevational view of the second preferred embodiment of the sweeping broom apparatus according to the present invention, connected to a vehicle, specifically a tractor.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[00021] Referring to Figures 1 through 3 of the drawings, it will be noted that Figures 1 and 2 illustrate a first preferred embodiment of the sweeping broom apparatus of the present invention, and Figure 3 illustrate a second preferred embodiment of the sweeping broom apparatus of the present invention.

[00022] Reference will now be made to Figures 1 and 2, which show a first preferred embodiment of the sweeping broom apparatus of the present invention, as indicated by general reference numeral 20. The sweeping broom apparatus 20 is for use with a vehicle, such as a tractor 22, which is only partially shown, or as part of an integrated sweeping vehicle. The tractor has a three point hitch 24 for receiving the sweeping broom apparatus 20 in supported relation thereon.

[00023] The first preferred embodiment sweeping broom apparatus 20 comprises a main body 21 having a debris receiving inlet 52 for receiving debris thereinto. There is also a connecting means, as indicated by the general reference numeral 30, for operatively connecting the main body 21 of the sweeping broom apparatus 20 to the vehicle 22, such that the sweeping broom apparatus 20 is received in supported relation on the pair of rearwardly extending mounting arms 23 of the three point hitch 24. The connecting means

30 comprises a generally vertically oriented base member 31 on the main body 21 having left and right generally vertically oriented side members 32,34 and upper and lower cross members 36,38. A pair of opposed spindles 40,42 are disposed at the bottom of the generally vertically oriented base member 31. A pair of forwardly extending lower arm members 45,47 are connected in pivoting relation at their respective back ends 45b,47b to the opposed spindles 40,42. The front ends 45f,47f of the forwardly extending lower arm members 45,47 are connectable to the tractor 22. A pair of forwardly extending upper arm members 44,46 are connected in pivoting relation at their respective back ends 44b,46b to a pair of co-operating flanges 46,48 that extend forwardly from the upper cross member 36. The front ends 44f,46f of the forwardly extending upper arm members 44,46 are connectable to the tractor 22.

[00024] The sweeping broom apparatus 20 comprises a debris receiving hopper 50 disposed at the front of the sweeping broom apparatus 20. In the first preferred embodiment, the rearwardly facing debris receiving inlet 52 is in the debris receiving hopper 50.

[00025] A broom shroud 60 is disposed immediately rearwardly of the debris receiving hopper 50. The broom shroud 60 has a front end 62, a back end 64, an open bottom 66 defined by a bottom edge

68, and a forwardly facing debris outlet 69 for permitting the directed egress of debris therefrom as a forwardly propelled stream of debris.

[00026] There is means for mounting the broom shroud 60 on the main body 21, for free vertical movement of the broom shroud 60 with respect to the main body 21. The means for mounting the broom shroud 60 comprises left and right mounting arms 54,56. The left and right mounting arms 54,56 are connected in pivoting relation to the broom shroud 60 and in pivoting relation to the main body 21. In this manner, the broom shroud 60 is vertically movable with respect to the main body 21. Accordingly, since broom shroud 60 is mounted for free vertical movement with respect to the main body 21, a small gap 26 exists between the debris receiving hopper 50 and the broom shroud 60.

[00027] An airflow obstructing means 70 is disposed around the bottom edge of the broom shroud 60 for substantially obstructing the egress of air from between the bottom edge of the broom shroud 60 and a surface being cleaned 29. The airflow obstructing means 70 comprises a series of overlapping rubber flaps 70 depending from the bottom edge 68 of the broom shroud 60.

[00028] A main sweeping broom 72 is operatively mounted within the broom shroud 60 for propelling debris forwardly from a surface being cleaned 29, thereby creating a stream of debris propelled forwardly through the forwardly facing debris outlet 69 directly to the rearwardly facing debris receiving inlet 52 of the main body 21. The means for mounting the main sweeping broom 72 on one of the broom shroud and the vehicle comprises left and right mounting arms 73,75. The left and right mounting arms 73,75 are connected in pivoting relation to the main sweeping broom 72 and in pivoting relation to the main body 21.

[00029] A dust-containing pliable cover 80 is preferably bellows-shaped and is preferably made from is chosen from the group of rubber, canvas, and rubber-covered canvas. The dust-containing pliable cover 80 is operatively connected in substantially sealed relation to the broom shroud 60 at the forwardly facing debris outlet 69 and is operatively connected in substantially sealed relation to the main body 21, specifically the debris receiving hopper 50, at the debris receiving inlet 52 for containing dust from the stream of debris propelled forwardly through the forwardly facing debris outlet 69. In the first preferred embodiment, as illustrated, the dust-containing pliable cover 80 is operatively connected in removable and replaceable relation to the broom shroud 60 at the forwardly facing debris outlet 69, and is operatively

connected in removable and replaceable relation to the broom shroud 60 at the forwardly facing debris outlet 69.

[00030] More specifically, the dust-containing pliable cover 80 comprises a sheet of flexible soft synthetic rubber material with a protective cut-proof covering, and is preferably zig-zag shaped in cross-section to permit maximum flexibility and extension of the dust-containing pliable cover 80. The front edge 82 of the dust-containing pliable cover 80 has a front strip of sealing material 83 secured thereto. The front strip of sealing material 83 is shaped and dimensioned to seal against the back surface 51 of the debris receiving hopper 50 around the debris receiving inlet 52, thereby precluding dust from escaping between the debris receiving hopper 50 and the dust-containing pliable cover 80.

[00031] The back edge 84 of the dust-containing pliable cover 80 has a back strip of sealing material 85 secured thereto. The back strip of sealing material 85 is shaped and dimensioned to seal against the front surface 61 of the broom shroud 60 around the forwardly facing debris outlet 69, thereby precluding dust from escaping between the debris receiving hopper 50 and the dust-containing pliable cover 80.

[00032] The front strip of sealing material 83 and the back strip of sealing material 85 are each preferably made from a pliable synthetic rubber material, or any other suitable material.

[00033] A plurality of threaded fasteners 88 are used to secure the dust-containing pliable cover 80 in removable and replaceable relation along its front edge 82 to the back surface 51 of the debris receiving hopper 50 and to secure the dust-containing pliable cover 80 in removable and replaceable relation along its back edge 84 to the front surface 61 of the broom shroud 60.

[00034] In the above described manner, the dust-containing pliable cover 80 provides a physical means of sealing the gap 26 between the debris receiving hopper 50 and the broom shroud 60, thus precluding dust from the forwardly propelled stream of debris generated by the main sweeping broom 72 from escaping to the ambient atmosphere.

[00035] Reference will now be made to Figure 3, which shows a second preferred embodiment of the sweeping broom apparatus according to the present invention, as indicated by reference numeral 220. The second preferred embodiment sweeping broom apparatus 220 is similar to the first preferred embodiment sweeping broom apparatus 20, except that there is a debris receiving

elevator 290 that directly receives the forwardly propelled stream of debris generated by the main sweeping broom 272, and deposits the received debris into the hopper 250. The broom shroud 260 is disposed immediately rearwardly of the elevator 290.

[00036] In this case, the dust-containing pliable cover 280 is operatively connected in substantially sealed relation to the broom shroud 260 at its forwardly facing debris outlet 269 and is operatively connected in substantially sealed relation to the debris receiving elevator 290 at its debris receiving inlet 292 for containing dust from the stream of debris propelled forwardly through the forwardly facing debris outlet 269.

[00037] As can be understood from the above description and from the accompanying drawings, the present invention provide a dustless sweeping broom apparatus that precludes the egress of dust and other fine particulate material from the street sweeping vehicle, in the case that there is a physical separation between the broom shroud and the hopper or debris elevator, even when the broom and broom shroud are tracking undulations in the surface being cleaned, all of which features are unknown in the prior art.

[00038] Other variations of the above principles will be apparent to those who are knowledgeable in the field of the invention, and

such variations are considered to be within the scope of the present invention. Further, other modifications and alterations may be used in the design and manufacture of the sweeping broom apparatus of the present invention without departing from the spirit and scope of the accompanying claims.

I CLAIM:

1. A sweeping broom apparatus comprising:

a main body having a debris receiving inlet;

connecting means for operatively connecting said main body to a vehicle;

5 a broom shroud having a front end, a back end, an open bottom defined by a bottom edge, and a forwardly facing debris outlet for permitting the directed egress of debris therefrom as a forwardly propelled stream of debris;

10 means for mounting said broom shroud on said main body, for free vertical movement of said broom shroud with respect to said main body;

15 airflow obstructing means disposed around the bottom edge of said broom shroud for substantially obstructing the egress of air from between the bottom edge of said broom shroud and the surface being cleaned;

20 a main sweeping broom operatively mounted within said broom shroud for propelling debris forwardly from a surface being cleaned, thereby creating a stream of debris propelled forwardly through said forwardly facing debris outlet to said debris receiving inlet of said vehicle; and,

25 a dust-containing pliable cover connected in substantially sealed relation to said broom shroud at said forwardly facing debris outlet and connected in substantially sealed relation to said main body at said debris receiving inlet for containing dust from said stream of debris propelled forwardly through said forwardly facing debris outlet.

2. The sweeping broom apparatus of claim 1, wherein said dust-containing pliable cover is connected in removable and replaceable relation to said broom shroud at said forwardly facing debris outlet.

3. The sweeping broom apparatus of claim 1, wherein said dust-containing pliable cover is connected in removable and replaceable relation to said main body at said debris receiving inlet.

4. The sweeping broom apparatus of claim 1, wherein said dust-containing pliable cover is bellows-shaped.

5. The sweeping broom apparatus of claim 4, wherein said dust-containing pliable cover is made from is chosen from the group of rubber, canvas, and ruber-covered canvas.

6. The sweeping broom apparatus of claim 1, wherein said connecting means for operatively connecting said main body to a vehicle comprises a pair of forwardly extending upper arm members and a pair of forwardly extending lower arm members.

7. The sweeping broom apparatus of claim 7, wherein said forwardly extending upper arm members are connected in pivoting relation at their respective back ends to said main body.

8. The sweeping broom apparatus of claim 8, wherein said forwardly extending lower arm members are connected in pivoting relation at their respective back ends to said main body.

9. The sweeping broom apparatus of claim 1, wherein said means for mounting said broom shroud on said main body comprises left and right mounting arms.

10. The sweeping broom apparatus of claim 10, wherein said left and right mounting arms are connected in pivoting relation to said broom shroud and in pivoting relation to said main body.

11. The sweeping broom apparatus of claim 1, wherein said sweeping broom apparatus further comprises a debris receiving hopper, wherein said debris receiving inlet is at said debris receiving hopper.

12. The sweeping broom apparatus of claim 11, wherein said broom shroud is disposed immediately rearwardly of said hopper.

13. The sweeping broom apparatus of claim 12, wherein said dust-containing pliable cover is connected in substantially sealed relation to said debris receiving hopper at said debris receiving inlet.

14. The sweeping broom apparatus of claim 1, wherein said sweeping broom apparatus further comprises a debris receiving elevator, wherein said debris receiving inlet is at said debris receiving elevator.

15. The sweeping broom apparatus of claim 14, wherein said broom shroud is disposed immediately rearwardly of said elevator.

16. The sweeping broom apparatus of claim 15, wherein said dust-containing pliable cover is connected in substantially sealed relation to said debris receiving elevator at said debris receiving inlet.

17. A sweeping broom apparatus comprising:

a main body having a debris receiving inlet;

connecting means for operatively connecting said main body to a vehicle;

5 a broom shroud having a front end, a back end, an open bottom defined by a bottom edge, and a forwardly facing debris outlet for permitting the directed egress of debris therefrom as a forwardly propelled stream of debris;

10 means for mounting said broom shroud on said main body, for free vertical movement of said broom shroud with respect to said main body;

airflow obstructing means disposed around the bottom edge of said broom shroud for substantially obstructing the egress of

air from between the bottom edge of said broom shroud and the
15 surface being cleaned;

a main sweeping broom operatively mounted within said
broom shroud for propelling debris forwardly from a surface being
cleaned, thereby creating a stream of debris propelled forwardly
through said forwardly facing debris outlet to said debris
20 receiving inlet of said vehicle; and,

means for mounting said main sweeping broom on one of
said broom shroud and said vehicle, for free vertical movement of
said main sweeping broom with respect to said broom shroud and said
vehicle.

18. The sweeping broom apparatus of claim 17, wherein said
connecting means for operatively connecting said main body to a
vehicle comprises a pair of forwardly extending upper arm members
and a pair of forwardly extending lower arm members.

19. The sweeping broom apparatus of claim 18, wherein said
forwardly extending upper arm members are connected in pivoting
relation at their respective back ends to said main body.

20. The sweeping broom apparatus of claim 19, wherein said forwardly extending lower arm members are connected in pivoting relation at their respective back ends to said main body.

21. The sweeping broom apparatus of claim 17, wherein said means for mounting said broom shroud on said main body comprises left and right mounting arms.

19. The sweeping broom apparatus of claim 18, wherein said left and right mounting arms are connected in pivoting relation to said broom shroud and in pivoting relation to said main body.

20. The sweeping broom apparatus of claim 17, wherein said means for mounting said broom shroud on a vehicle comprises left and right mounting arms.

21. The sweeping broom apparatus of claim 20, wherein said left and right mounting arms are connected in pivoting relation to said broom shroud and in pivoting relation to said main body.

22. The sweeping broom apparatus of claim 17, wherein said sweeping broom apparatus further comprises a debris receiving hopper, wherein said debris receiving inlet is at said debris receiving hopper.

23. The sweeping broom apparatus of claim 22, wherein said broom shroud is disposed immediately rearwardly of said hopper.

24. The sweeping broom apparatus of claim 17, wherein said sweeping broom apparatus further comprises a debris receiving elevator, wherein said debris receiving inlet is at said debris receiving elevator.

25. The sweeping broom apparatus of claim 24, wherein said broom shroud is disposed immediately rearwardly of said elevator.

26. The sweeping broom apparatus of claim 17, wherein said means for mounting said main sweeping broom on one of said broom shroud and said vehicle comprises left and right mounting arms.

27. The sweeping broom apparatus of claim 26, wherein said left and right mounting arms are connected in pivoting relation to said main sweeping broom and in pivoting relation to said main body.

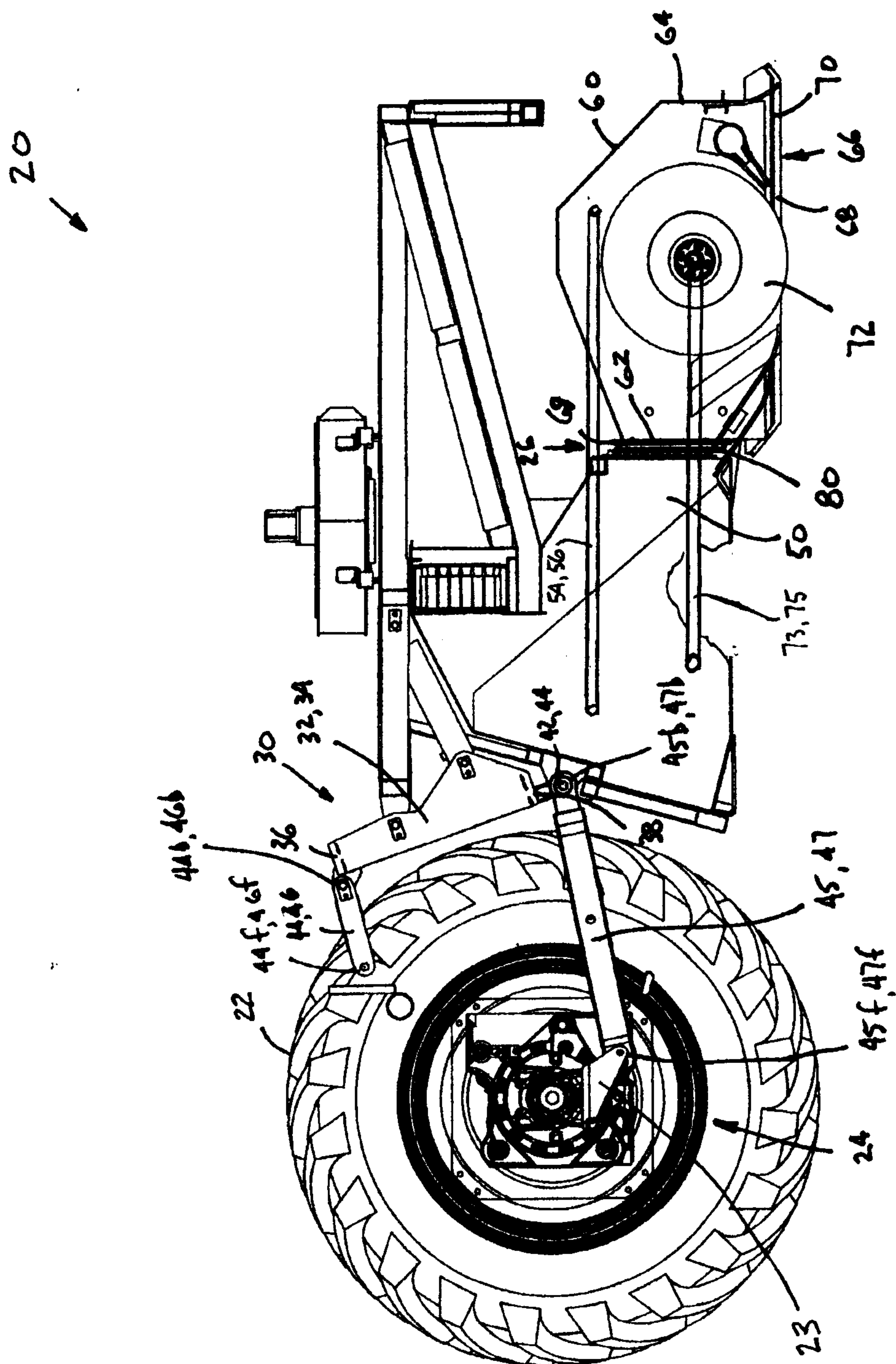


Fig. 1

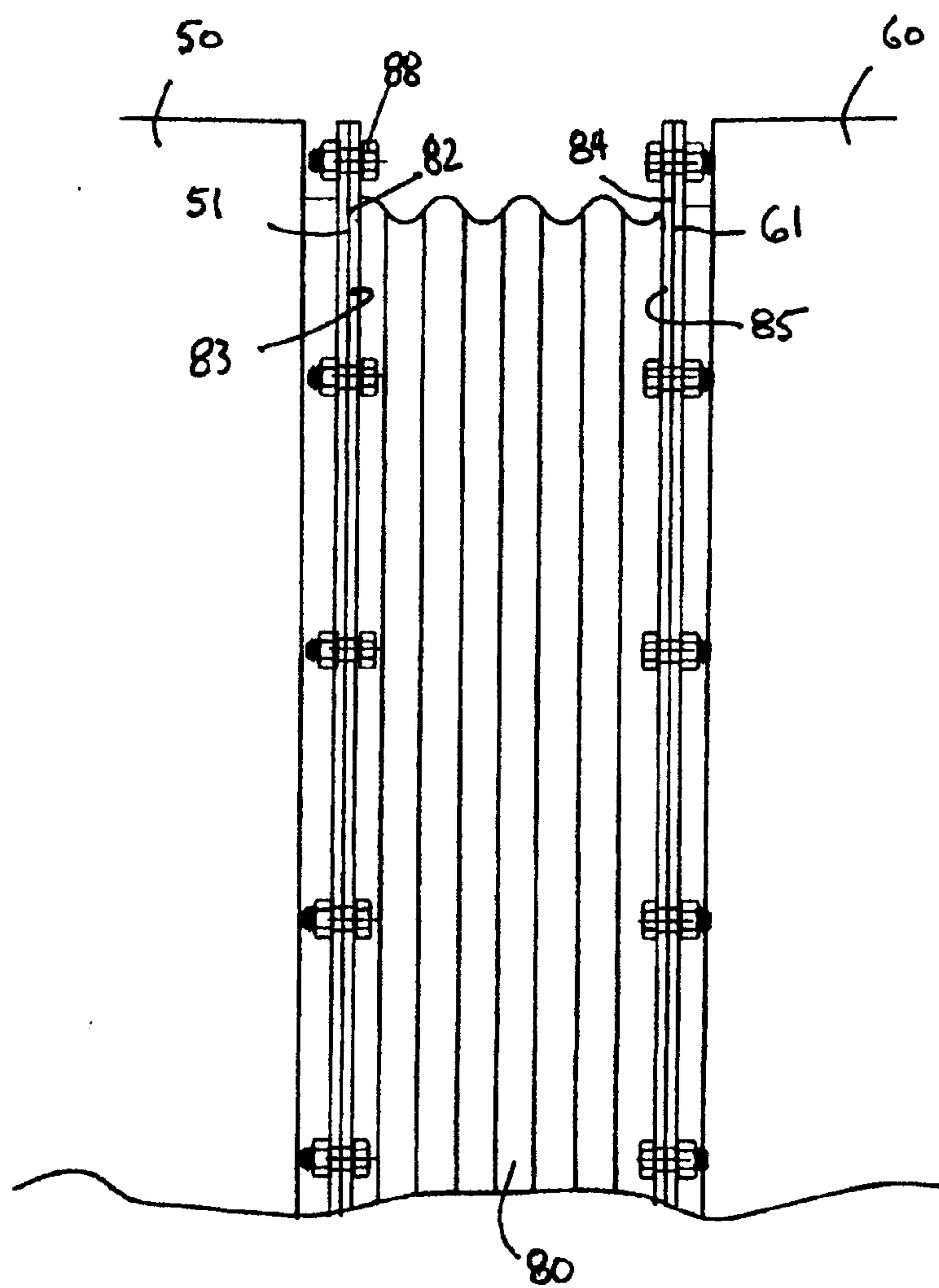


FIG.2

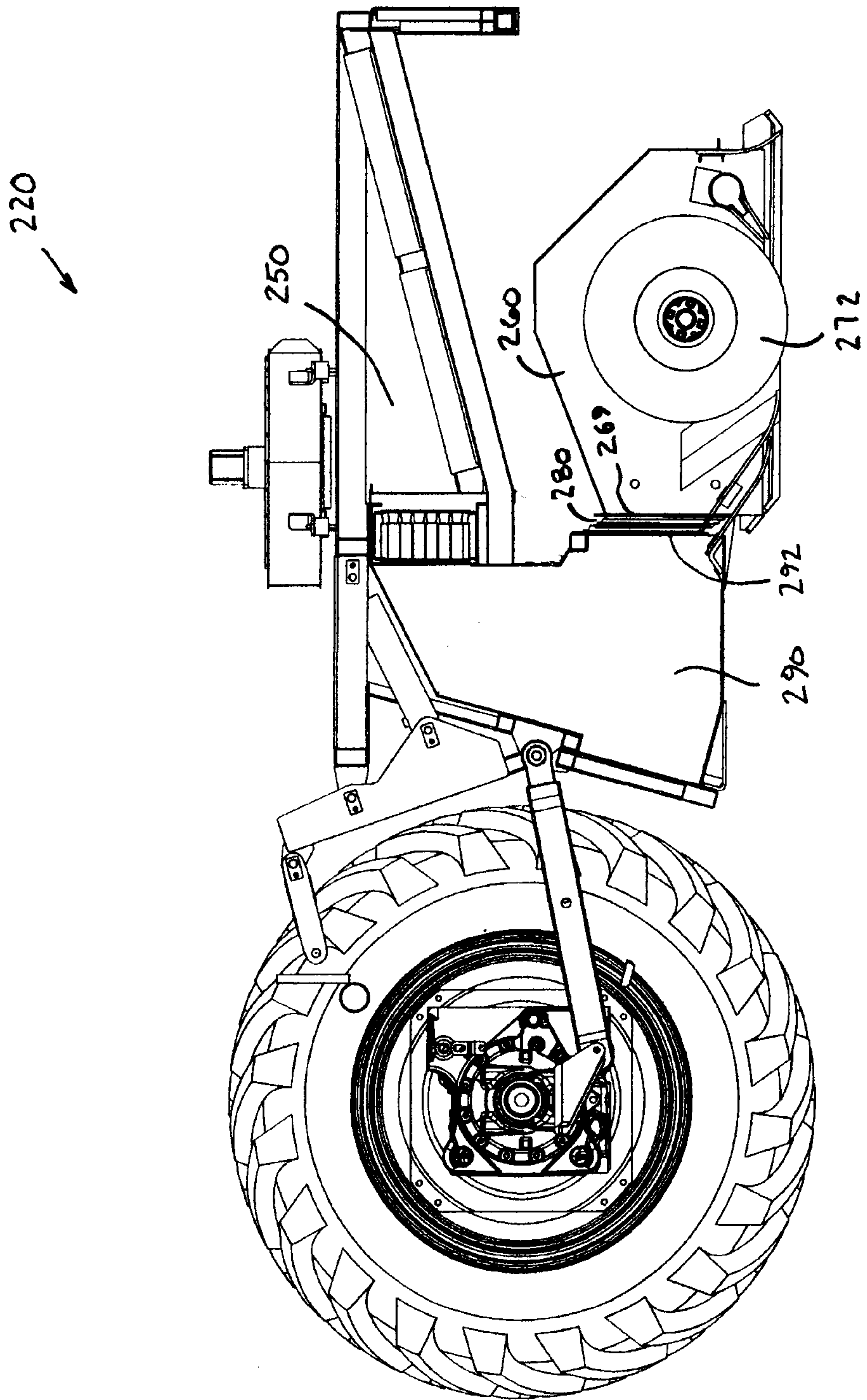


FIG. 3

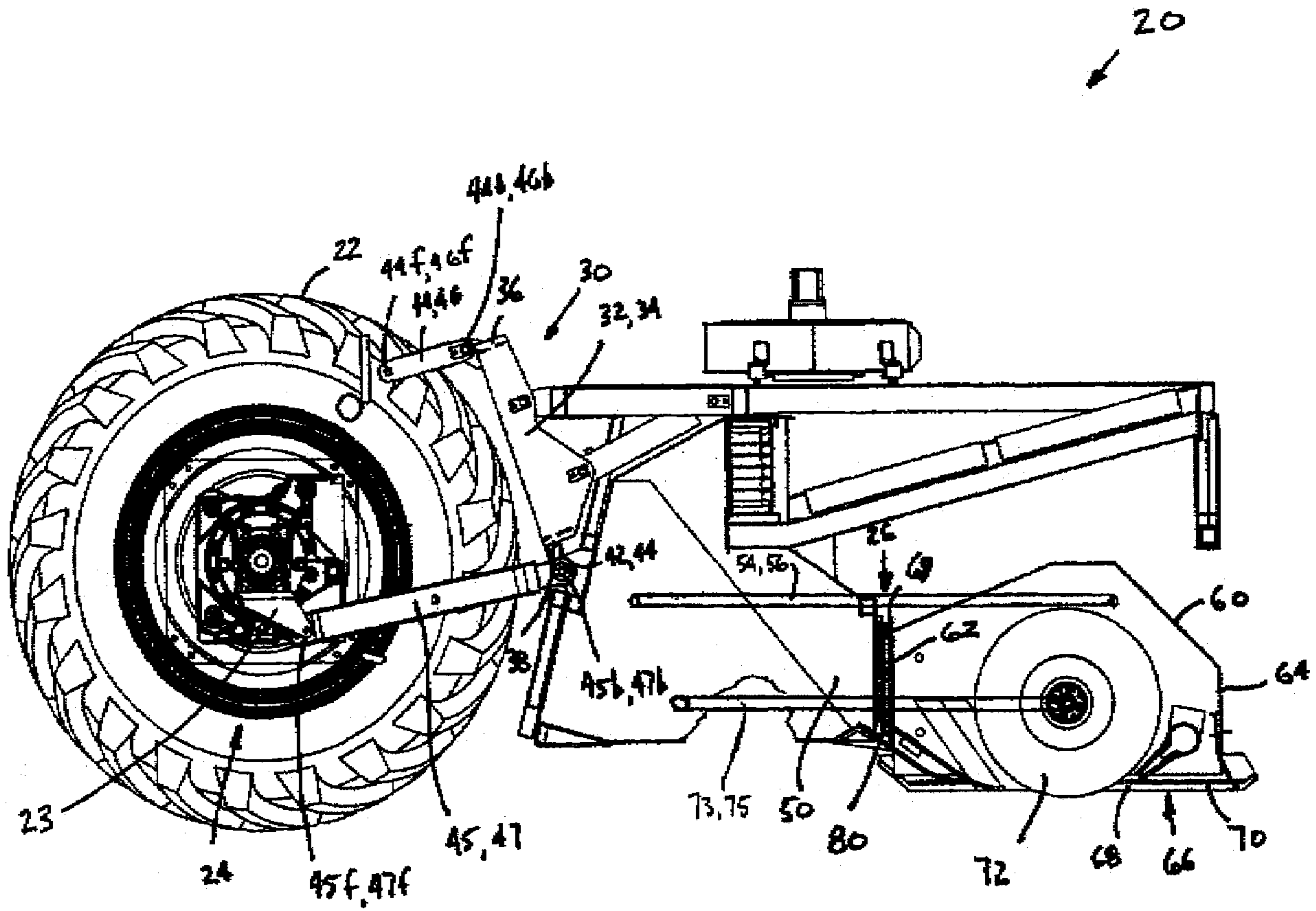


FIG. 1