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(54) Sweeping aiding device for municipal street cleaning sweepers

(57) A sweeping aiding device for municipal street cleaning sweepers comprises a servo-assisted articulated arm which can be coupled to a street sweeper and comprises a windable sheath, which bear, at one end portion thereof, a sweeping lance which can deliver pressurized water and can be gripped by an operator.

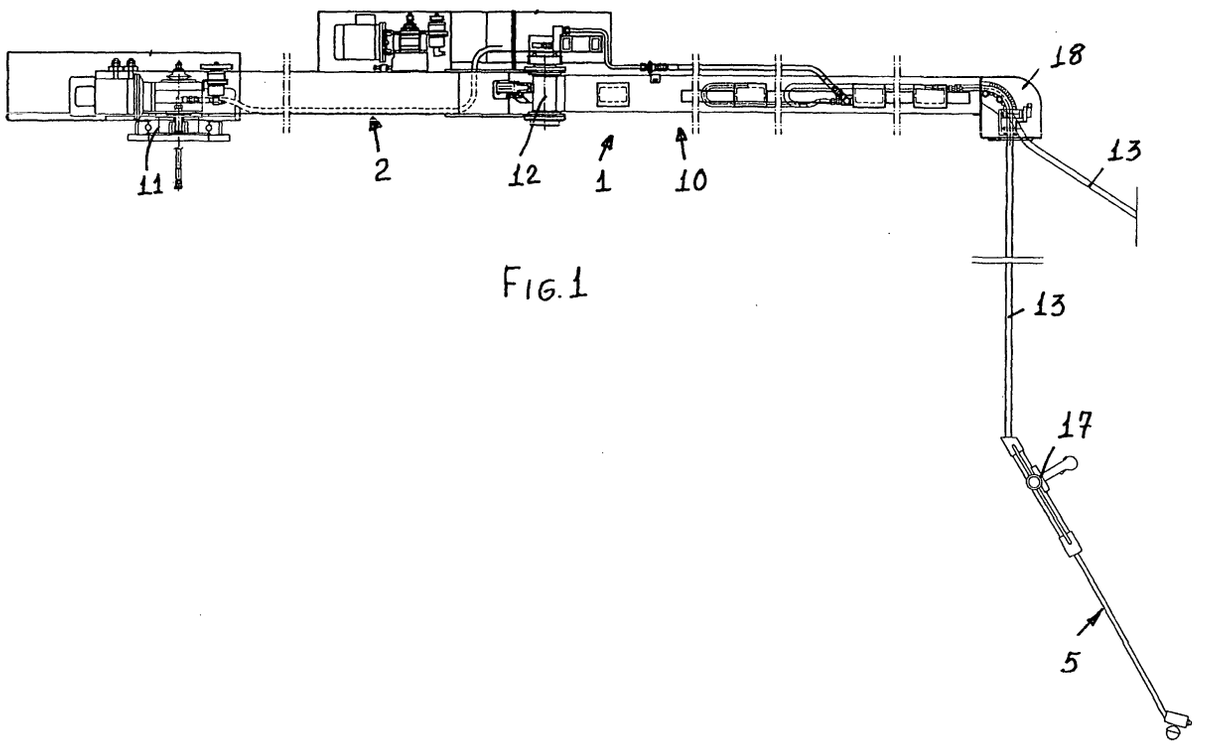

FIG.1

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Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a sweeping aiding device for municipal street cleaning sweepers.

[0002] As is known, street sweepers are conventionally used for cleaning municipal streets and comprise a plurality of motor driven cleaning brushes, specifically designed for sweeping the street surface and collecting dirt therefrom.

[0003] The mentioned street sweepers are adapted to operate in an optimum manner if the street being cleaned is free and not obstructed by obstacles.

[0004] However, in the presence of obstacles, chiefly constituted by parked cars and vehicles, the cleaning brushes cannot arrive at the road edge, near the sidewalk, where the most part of dirt accumulates, including that coming from the sidewalk.

[0005] In order to overcome the above mentioned drawback, a walking operated, provided with a broom or other sweeping instrument, can collect said dirt at a region which can be accessed by the sweeper brushes.

[0006] However, this operation is very fatiguing and, in each case it is not possible for the operator to remove waste materials arranged, for example, under the parked cars.

SUMMARY OF THE INVENTION

[0007] Accordingly, the aim of the present invention is to provide a sweeping aiding device, specifically designed for solving the above mentioned problems affecting the prior art.

[0008] Within the above mentioned aim, a main object of the present invention is to provide such a sweeping aiding device allowing to a walking operator to easily and quickly collect dirt and waste materials to direct the latter to the sweeper cleaning brushes.

[0009] Another object of the present invention is to provide such a sweeping aiding device which does not require any great physical effort by the operator and which can also be used for a long period.

[0010] Yet another important object of the present invention is to provide such a sweeping aiding device which also allows to properly clean streets and sidewalks even in regions thereof occupied by parked vehicles, and this by aiding the cleaning operator by a safe, efficient and noiseless system which, in addition, can be also easily controlled.

[0011] According to one aspect of the present invention, the above mentioned aim and objects, as well as yet other objects, which will become more apparent hereinafter, are achieved by a sweeping aiding device, to be applied to municipal street sweepers, characterized in that said device comprises a servo-controlled articulated arm, which can be coupled to a street sweeper and comprises a windable sheath bearing, at one end portion thereof, a sweeping lance adapted to provide pressurized water and to be gripped by an operator.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] Further characteristics and advantages of the present invention will become more apparent hereinafter from the following detailed disclosure of the preferred, though not exclusive embodiment of the invention which is illustrated, by way of an indicative, but not limitative, example in the accompanying drawings, where:

Figure 1 is a schematic side elevation view of the sweeping aiding device according to the present invention, as shown in an extended condition thereof;
Figure 2 is a further side elevation view, on an enlarged scale, illustrating in a more detailed manner, the two articulated joints of the sweeping aiding device;
Figure 3 is a top plan view, as partially cross-sectioned, illustrating the two articulated joints of the sweeping aiding device according to the present invention;
Figure 4 is an elevation view illustrating the sweeping aiding device, applied to a street sweeper, during the use of said device;
Figure 5 is a side elevation view illustrating the sweeping aiding device, applied to a street sweeper, during the use thereof;
Figure 6 is top plan view illustrating the sweeping aiding device according to the invention applied to a street sweeper, in a closure condition thereof, for non operating shipments;
Figure 7 is a further top plan view, illustrating the sweeping aiding device according to the invention applied to a street sweeper, during the use thereof;
Figure 8 is a further top plan view, illustrating the operating range of the sweeping aiding device according to the present invention, at a right region of the street sweeper;
Figure 9 is a further top plan view, illustrating the use or operating range of the sweeping aiding device, at a left region of the street sweeper;
Figure 10 is a side elevation view illustrating in a more detailed manner the second segment of the articulated arm;
Figure 11 is a view, cross-sectioned according to the section plane XI-XI of figure 10, of the second segment of the articulated arm;
Figure 12 is a front view of the end portion of the second segment of the articulated arm;
Figure 13 is a side view of the end portion of the second segment; and
Figure 14 is a top plan view of the end portion of the second segment.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0013] With reference to the number references of the above mentioned figures, the sweeping aiding device, according to the present invention, which has been generally indicated by the reference number 1, comprises a semiautomatic two articulated-joint arm, comprising a first arm segment 2 fixed at the middle region of the street sweeper 3 above the front portion of the tilting casing 4 thereof, through a first articulated joint 11.

[0014] The above mentioned arm is of a self-moving type, i.e. it can be driven in a plane parallel to the ground, and arranged at a level greater than the maximum height of the sweeper.

[0015] The sweeping operation is performed by using pressurized water delivered from the street sweeping machine and, to that end, the sweeping aiding device ends with a sheath 13 supplying and supporting a sweeping lance 5.

[0016] Said sweeping lance is driven by a walking operator 6, and allow to displace dirt and waste materials from the sidewalks 7 and from the bottom of the cars or vehicles 8 parked at the central portion of the street 9, from which said dirt and waste materials are collected by the sweeper, which in the meanwhile washes the street surface.

[0017] The articulated arm, as is shown, comprises a second segment 10 coupled to the first segment 2 by a second articulated joint 12.

[0018] The two arm segments 2 and 10, in the maximally extended condition thereof, have a length larger than six meters, but a specifically designed system for winding and automatically recovering the sheath 13 allows the operator to move away, if necessary, by other three meters from the sweeper.

[0019] The lance 5 supporting sheath 13 slides, at the end portion of the arm, in a special supporting element 14, of a joystick type, which automatically drives the arm segment, thereby providing an operator tracking length reserve, independently from the movement direction of the operator.

[0020] Thus, the walking operator can perform the dirt and waste material removal operation, without considering the position of the sweeper arm.

[0021] The sheath 13 ends with an electric connector and a water quick fitting, allowing, as the sweeping aiding device is in an idle condition above the sweeper, to disconnect the lance 5 for storing it at any other desired location.

[0022] The supporting sheath 13 will be automatically wound within the arm segment 10 and will be bracketed on a side of the casing or box 4.

[0023] As is clearly shown in figures 1, 10 and 11, the sheath 13 is wound, by a specifically designed winding system, inside the second segment 10 on a cable holder chain 19 coupled to the aiding shoes 20, which can slide at the top in a polyethylene guiding element 21.

[0024] Inside said segment 20 which has an oval cross-section, are moreover provided, at the bottom thereof, electric cable ducts or channels 22.

[0025] As shown, the sheath 13 projects from the second arm segment 10 through the end portion 18 comprising a control system for controlling the position and movement of said sheath, said control system comprising two potentiometers 23 and 24, each of which is provided with small rollers 25, arranged in respective orthogonal planes, thereby to transmit an electric signal to the control central unit controlling the servomotors 26 and 27 which respectively drive the first and second articulated joints.

[0026] Thus, as the operator walks in any direction through the plane, he will drive or displace the sheath in a well defined direction, i.e. a direction precisely defined by the rotary movement of the two mentioned potentiometers.

[0027] Thus, said potentiometers can detect or sense the operator moving speed, so as to properly control the servomotors of the articulated arm to properly track or follow the moving operator.

[0028] A spotlight element, having a halogen lamp, mounted on the end portion 18 of the second arm segment 10, will allow the sweeper to also operate in a night period, by diffusely illuminating from the top the working region.

[0029] In their rest or idle position, shown in figure 6, the two arm segments are compasses-like closed, and are bracketed on the sweeper 3 by an automatic safety locking system.

[0030] In such an arrangement, the sweeping aiding device will be held inside the sweeper perimeter thereby meeting the maximum height values provided by the Street Code.

[0031] From the above disclosure it should be apparent that the sweeping aiding device according to the present invention is adapted to indifferently operate on both sides of the sweeper.

[0032] A selector or switch element, arranged on the cab button panel of the sweeper will allow to select the working side and then, the system controlling softer will prevent any further movements on the other side of the sweeper.

[0033] The rotary movements of the two arm segments are motor driven.

[0034] Torque limiting elements, together with damping rubber section elements, arranged on the sides of the arms, will protect the equipment from accidental impacts.

[0035] The device bearing construction 15 is coupled, by a removable coupling means, to a fixing or attachment plate 16, rigid with the sweeper casing or box 4.

[0036] More specifically, said sweeping aiding device anchoring plate 16 is removably coupled, by a coupling bracket, to the front portion of the casing 4 of the sweeper 3.

[0037] By way of an indicative example, the bearing

construction can be subjected to the following loads:

Static axle load: about 200 kg
Static bending moment: about 200 kg.m
(in any directions through 360° about the axle)
Overloads: the same overloads to which the sweeper is subjected in its regular street operation)

[0038] The handle 17 of the lance has integrated therein an on/off joystick electric control to allow the operator to adjust, through a knob control valve, the flow rate of the water being sprayed from the lance 5.

[0039] The device further comprises an independent electric panel, meeting the related CE standards, provided for driving and controlling the sweeper; it comprises: a PLC for controlling the operating and safety logic circuits; I/O cards for managing the transmitted signals; and the electric motor drives.

[0040] The device comprises moreover an independent pushbutton panel, mounted on the sweeper cab, and including the following control pushbuttons: on/off selector; emergency pushbutton; arm extending and withdrawing selector or switch; a selector for operating either at the right or at the left of the truck; a small panel for necessary alarms; an alarm reset pushbutton; and a lighting system on/off selector or switch.

[0041] The driver and walking operator can continuously communicate through a radio-wave interphone system, with an earphone for the walking operator and in a voiced manner for the driver, thereby providing a highly synchronous cooperating of the driver and operator.

[0042] The sweeper can also comprise, onboard, the following provisions, as necessary for operating the sweeping aiding device: electricity 24 V; voltage 24+/-15% Vcc; and useful power 0.85 kW, as necessary for power supplying the arm motors, lighting system and electronic cabinet.

[0043] Pressurized water is advantageously filtered and free of suspensions and has a rated pressure from 60 to 100 bars (adjustable), a maximum pressure of 110 bars and a maximum flowrate of 900 dm^3/h, for water supplying the water spraying lance.

[0044] The sweeping aiding device according to the present invention, can also perform, by small modifications, even a cleaning function, by using an air blower, having a 24 Vcc electric motor, to be coupled to the sheath in place of the sweeping lance, and can also be electrically supplied by the sheath.

[0045] Moreover, the device can also be applied on a tank truck and can be used for washing streets and sidewalks, since it would have available great amounts of water.

[0046] Furthermore, the device according to the invention can also be applied to a salt delivery truck, thereby delivering salt on the sidewalks and under the parked vehicles, under snow and ice condition.

[0047] It has been found that the invention fully achieves the intended aim and objects.

[0048] In fact, the invention provides a sweeping aiding device allowing to sweep and wash streets and sidewalks even in regions occupied by parked vehicles, aiding the operator through the use of a safe, efficient, noiseless and easily manoeuvrable system.

[0049] In practicing the invention, the used materials, as well as the contingent size and shapes can be any, depending on requirements.

Claims

1. A sweeping aiding device, to be applied to municipal street sweepers, **characterized in that** said device comprises a servo-controlled articulated arm, which can be coupled to a street sweeper and comprises a windable sheath bearing, at one end portion thereof, a sweeping lance adapted to provide pressurized water and to be gripped by an operator.

2. A device, according to claim 1, **characterized in that** said device comprises a semiautomatic two articulated joint arm, including a first arm segment fixed at the middle of the sweeper, above a front portion of the tilting casing or box thereof, through a first articulated joint.

3. A device, according to claim 1 or 2, **characterized in that** said articulated arm is self-movable in a plane parallel to the ground, arranged at a level greater than the maximum height of the sweeper.

4. A device, according to one or more of the preceding claims, **characterized in that** said articulated arm comprises a second arm segment, coupled to the first arm by a second articulated joint.

5. A device, according to one or more of the preceding claims, **characterized in that** said two arm segments, in a maximum extension condition thereof, have a length greater than six meters, an automatic winding and recovering system being moreover provided for winding the sheath to allow the operator to move away from the sweeper by additional three meters.

6. A device, according to one or more of the preceding claims, **characterized in that** the lance supporting sheath, at an end portion of the arm, slides in a joystick supporting element automatically driving the arm segments, thereby providing a reserve length for allowing the operator to easily follow the sweeper according to any directions.

7. A device, according to one or more of the preceding claims, **characterized in that** said sheath ends with an electric connector and a water quick fitting there-

by allowing, with said device in a rest condition on the sweeper, to disconnect said lance and store it at any other desired locations, said supporting sheath being automatically wound in said arm segment and being then bracketed on a sidewall of the sweeper casing.

8. A device, according to one or more of the preceding claims, **characterized in that** said sheath is wound by a winding system inside the second arm segment, on a cable holder chain associated with slidable shoes which can slide on the top in a polyethylene guiding element.

9. A device, according to one or more of the preceding claims, **characterized in that** at the bottom of said second arm segment are provided, inside said segment, having an oval cross-section, electric cable ducts.

10. A device, according to one or more of the preceding claims, **characterized in that** said sheath projects from said second arm segment through the end portion comprising a control system for controlling the position and movement of said sheath, said control system comprising two potentiometers, each including rollers arranged in respective orthogonal planes, to transmit an electric signal to a control central unit controlling the operation of the servomotors respectively driving the first articulated joint and second articulated joint, thereby, as the operator moves according to any direction, he will drive said sheath in an univocally defined direction, which is precisely defined by the rotary movements of said two potentiometers.

11. A device, according to one or more of the preceding claims, **characterized in that** said potentiometers are adapted to detect the operator moving speed, so as to operate the servomotors of the articulated arm to follow the operator movement.

12. A device, according to one or more of the preceding claims, **characterized in that** said device further comprises a spotlight element including a halogen lamp, mounted on the end portion of the second segment, and allowing the sweeper to also be used in night time, said spotlight diffusely illuminating the working region from the top.

13. A device, according to one or more of the preceding claims, **characterized in that**, at a rest or idle position thereof, said two articulated arm segments are compasses-like closed and bracketed on the sweeper by an automatic safety locking system, so that, in this arrangement, the size of said device will be held inside the sweeper perimeter, thereby meeting the maximum height values provided by the Street Code.

14. A device, according to one or more of the preceding claims, **characterized in that** said device is designed for indifferently working on both sides of the sweeper.

15. A device, according to one or more of the preceding claims, **characterized in that** said device further comprises a selector, arranged on a drive cab pushbutton panel, allowing to select the working side, to allow the system controlling software to prevent any movements on the other side of the sweeper.

16. A device, according to one or more of the preceding claims, **characterized in that** said arm segments are automatically rotatively driven, an that said device further comprises torque limiting elements which, together with damping rubber section elements, arranged on the sides of the arms, protect the device from accidental impacts.

17. A device, according to one or more of the preceding claims, **characterized in that** the device bearing structure is removably coupled to an attachment plate rigid with the sweeper casing.

18. A device, according to one or more of the preceding claims, **characterized in that** said plate is removably coupled, through a coupling bracket, to the front portion of the sweeper casing.

19. A device, according to one or more of the preceding claims, **characterized in that** said lance has a lance gripper in which is integrated an on/off joystick electric control allowing the operator to adjust, through a knob controlling valve, the water flowrate from said lance.

20. A device, according to one or more of the preceding claims, **characterized in that** said device further comprises an independent electric panel, meeting the CE's standards, adapted to drive and control the sweeper; said panel comprising a PLC for controlling the operating and safety logic circuits; I/O cards for managing the signals, and the electric motor drives.

21. A device, according to one or more of the preceding claims, **characterized in that** said device further comprises an independent push button panel, arranged in the sweeper drive cab, and including the following controls: on/off selector switch; emergency pushbutton; arm extending and withdrawing selector; a selector for allowing the device to operate either on the right or on the left of the sweeper truck; an alarm panel; an alarm reset pushbutton; a lighting on/off selector.

22. A device, according to one or more of the preceding claims, **characterized in that** said device further comprises, onboard of said sweeper, the following services for operating the sweeping aiding device: electricity 24 V; voltage 24+/-15% Vcc; and useful power 0.85 kW for power supplying the arm motors, the lighting system and electric cabinet.

23. A device, according to one or more of the preceding claims, **characterized in that** pressurized water is filtered and free of suspensions and has a rated pressure from 60 to 100 bars (adjustable), a maximum pressure of 110 bars and a maximum flowrate of 900 dm^3/h, for supplying said spraying lance.

24. A device, according to one or more of the preceding claims, **characterized in that** said device is also designed for providing a washing function, by using an air blower, including a 24 Vcc electric motor, to be coupled to said sheath in place of said sweeping lance and which is electrically power supplied by said sheath.

25. A device, according to one or more of the preceding claims, **characterized in that** said device is adapted to be applied on a tank truck and used for washing streets and sidewalks, having available large amounts of water.

26. A device, according to one or more of the preceding claims, **characterized in that** said device is adapted to be applied on a salt spreading truck, to spread salt on sidewalls and under parked vehicles, in snow and ice conditions.

27. A device, according to one or more of the preceding claims, **characterized in that** said device comprises one or more of the disclosed and/or illustrated characteristics.

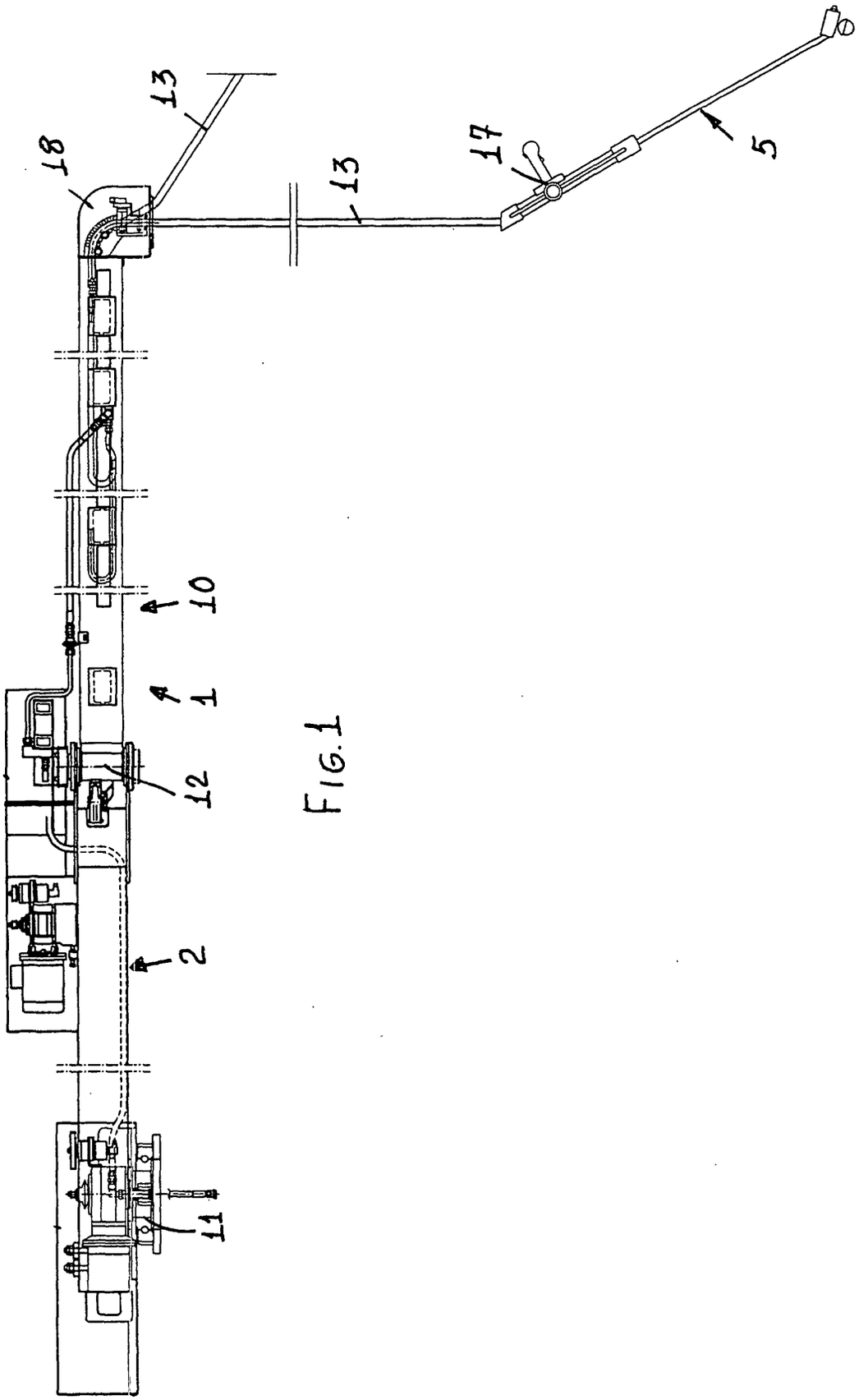

FIG. 1

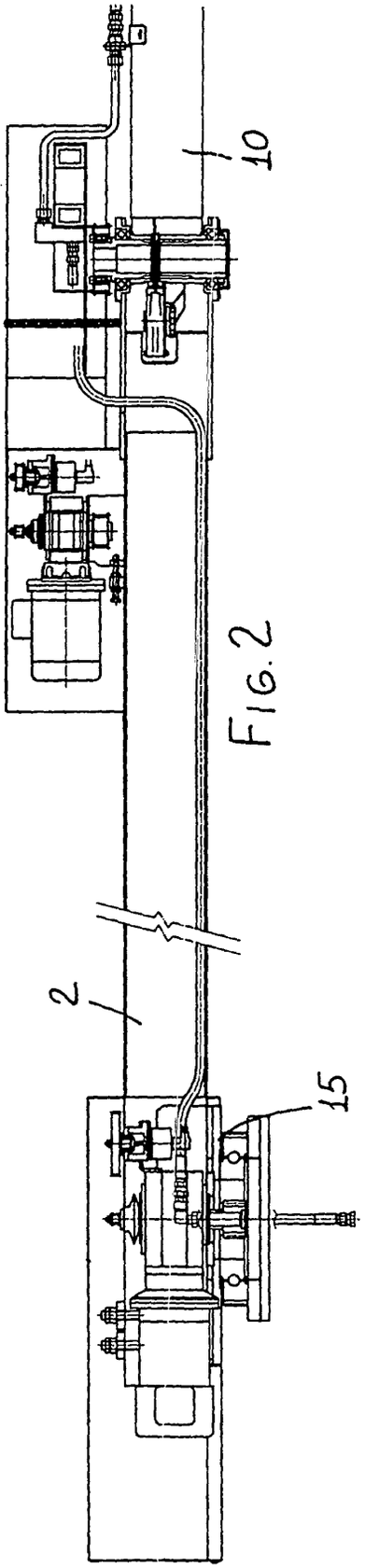

FIG. 2

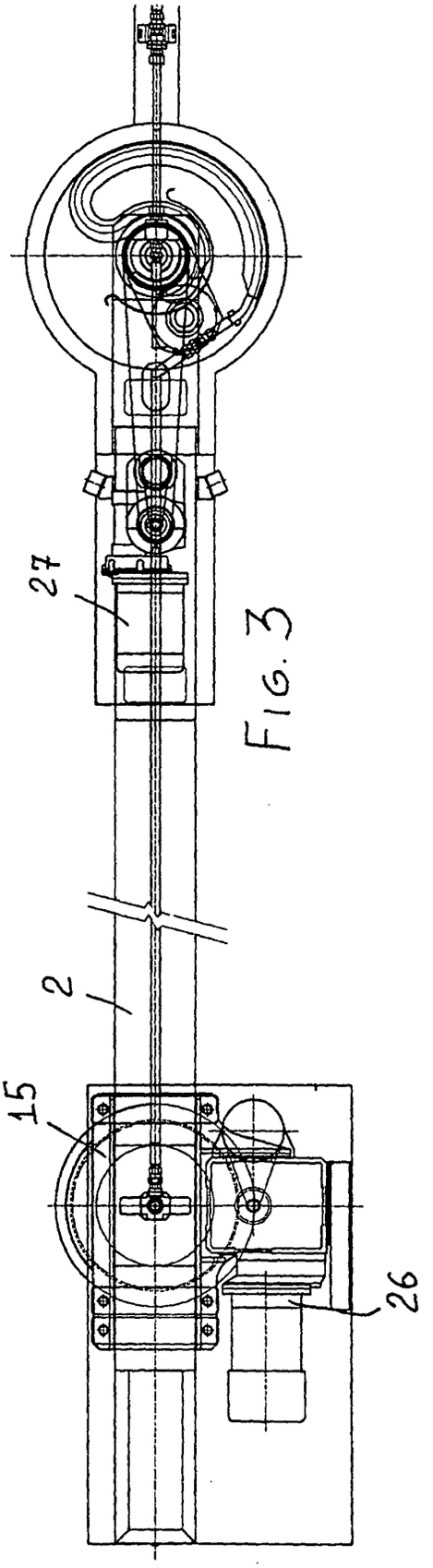

FIG. 3

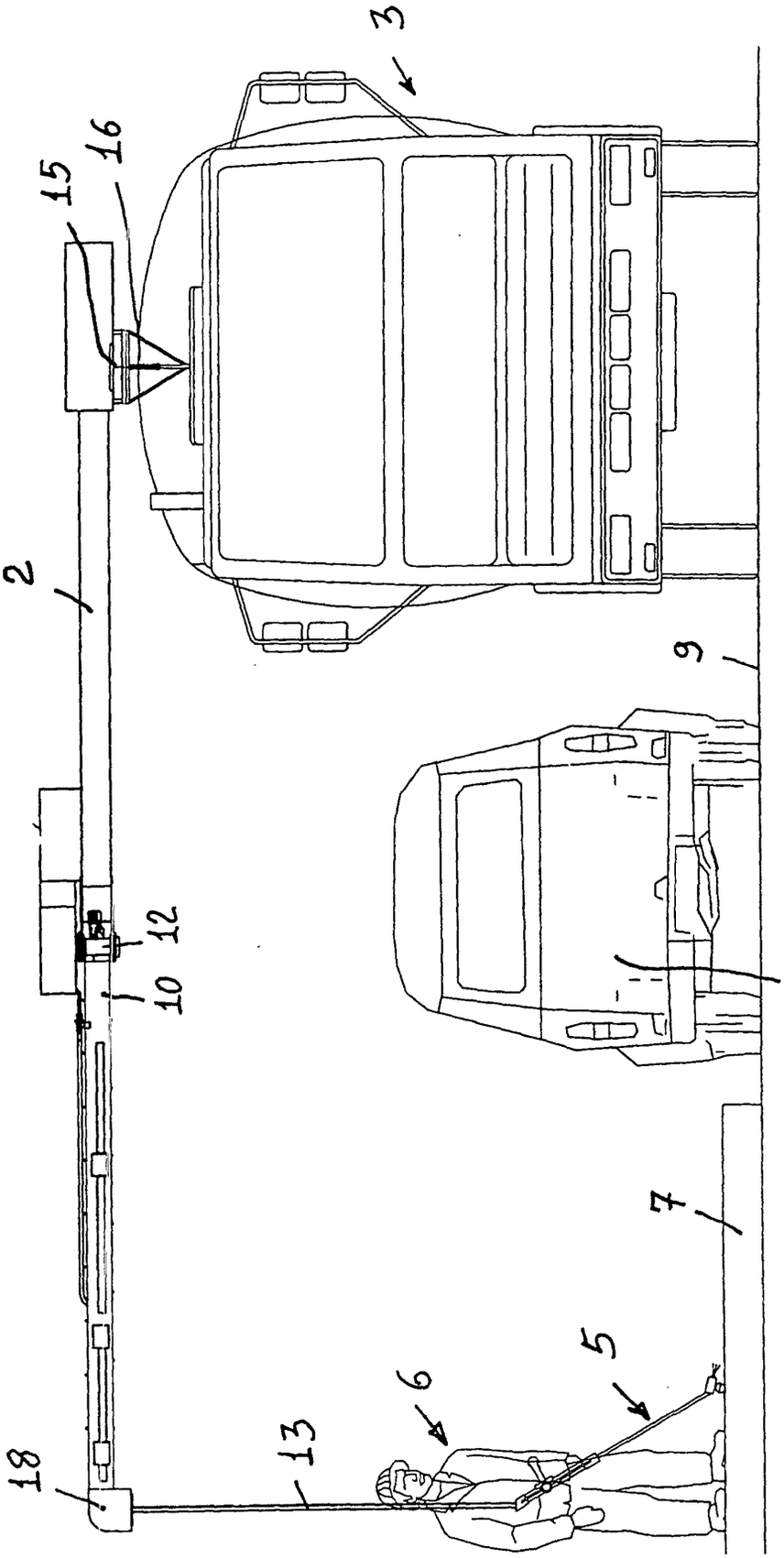

FIG. 4

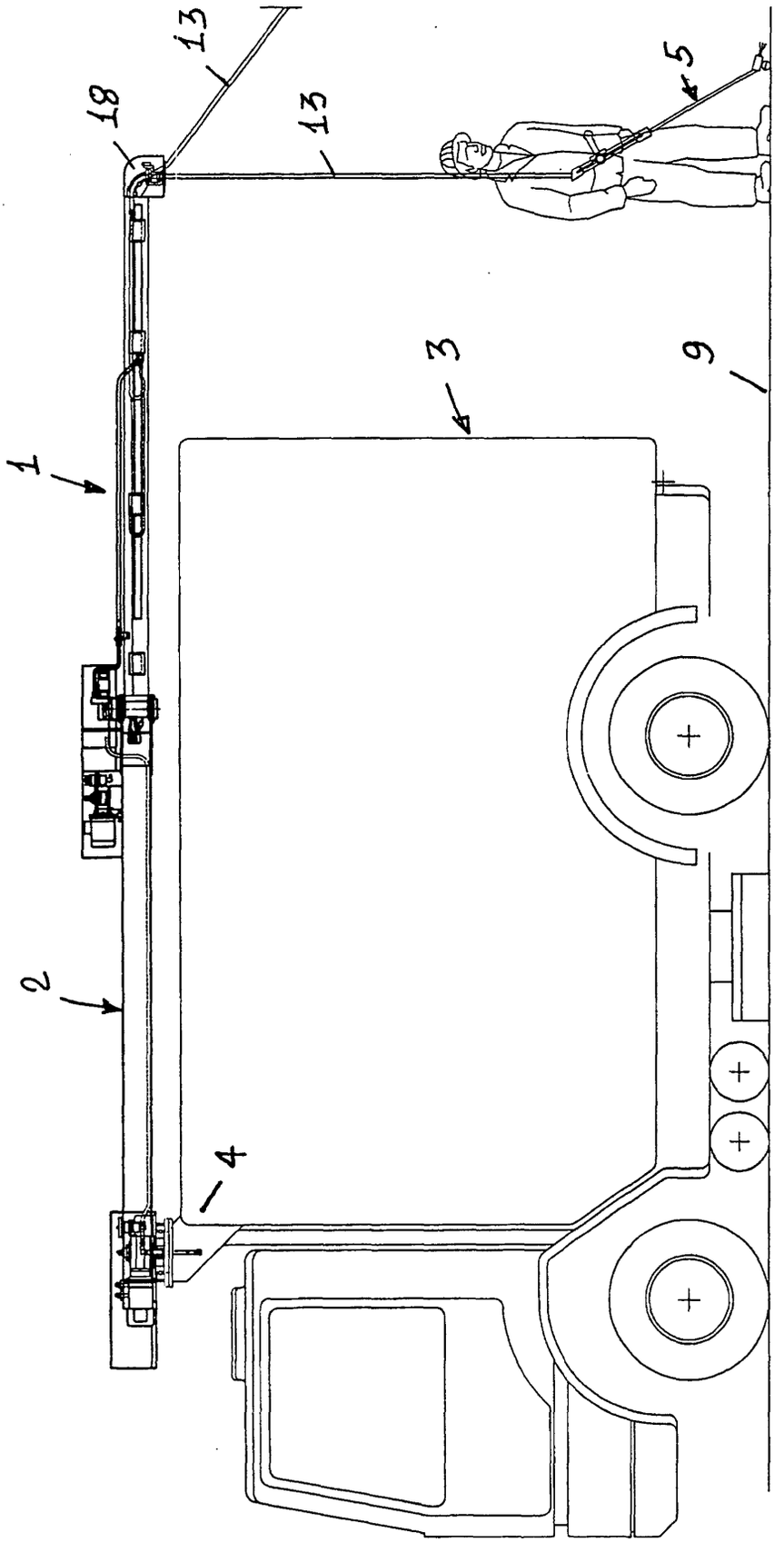

FIG. 5

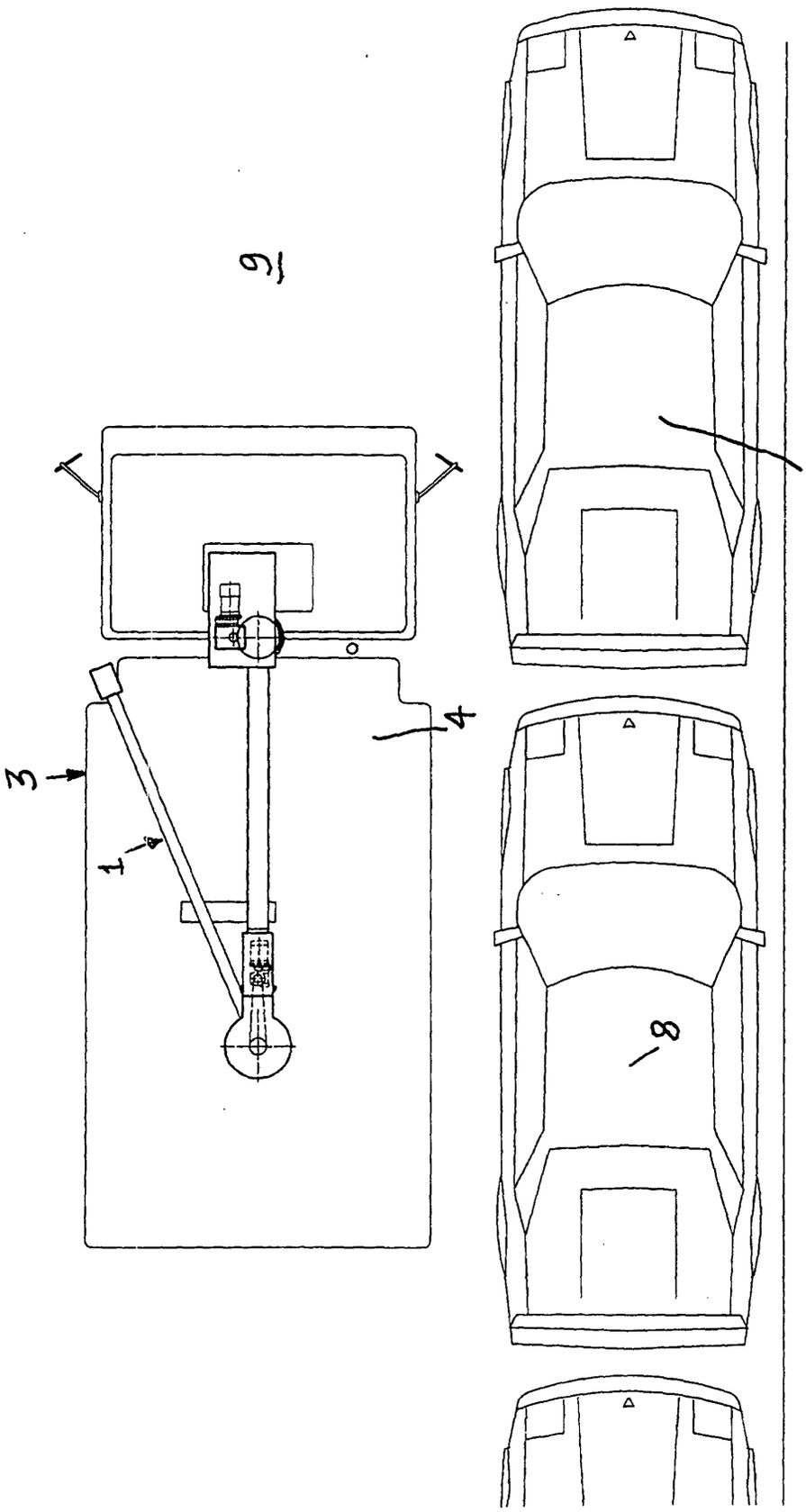

FIG. 6

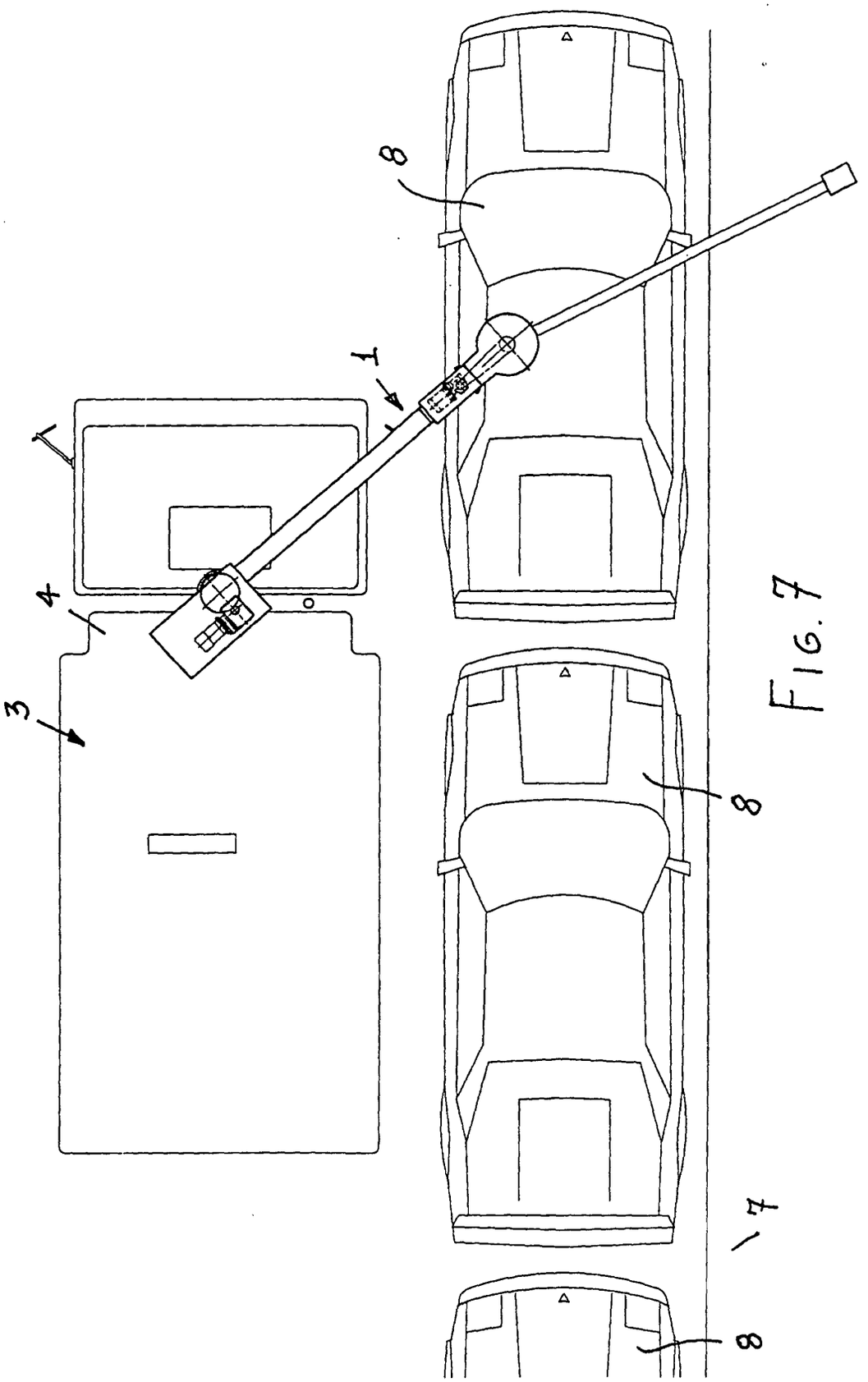

FIG. 7

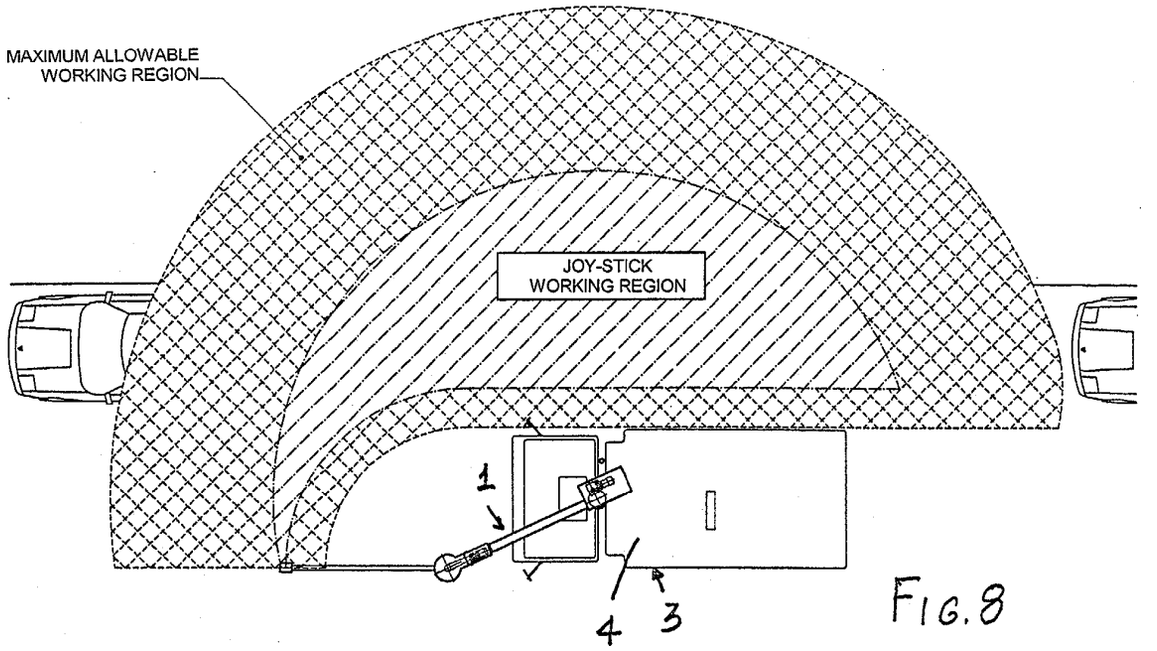
MAXIMUM ALLOWABLE
WORKING REGION
JOY-STICK
WORKING REGION
1
4
3

FIG. 8

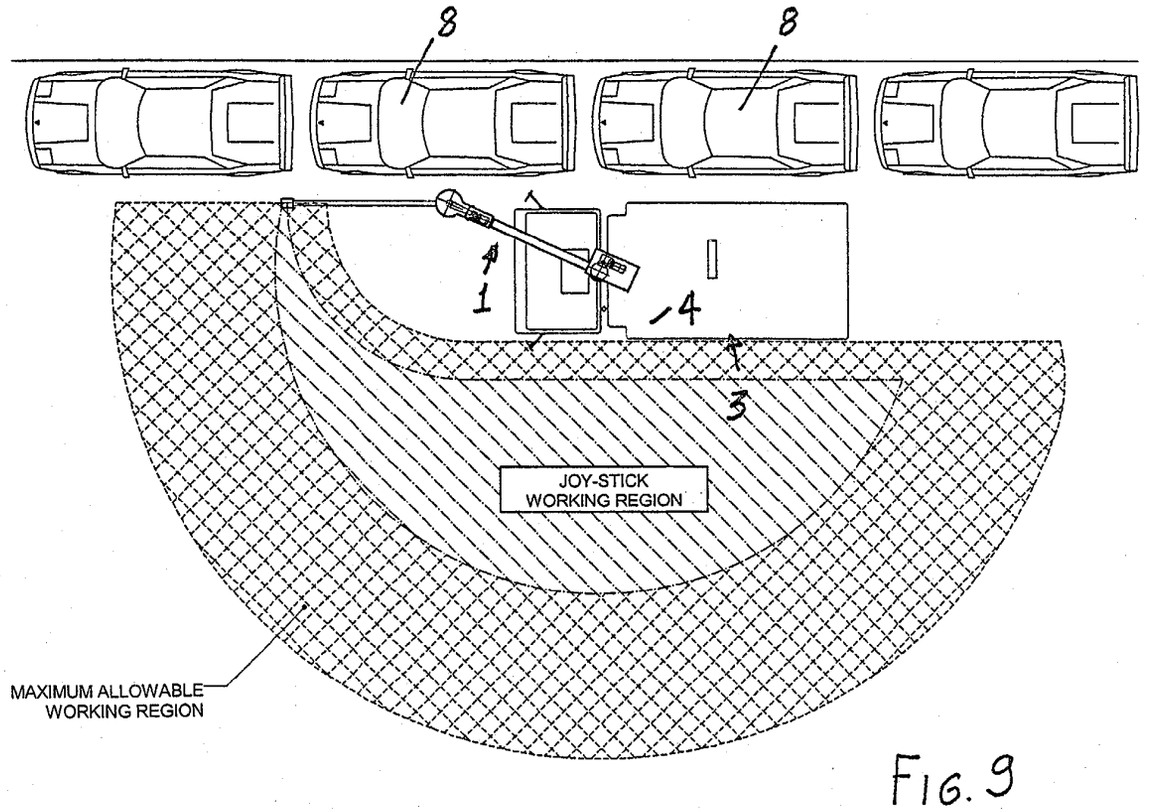
8
8
1
4
3
JOY-STICK
WORKING REGION
MAXIMUM ALLOWABLE
WORKING REGION

FIG. 9

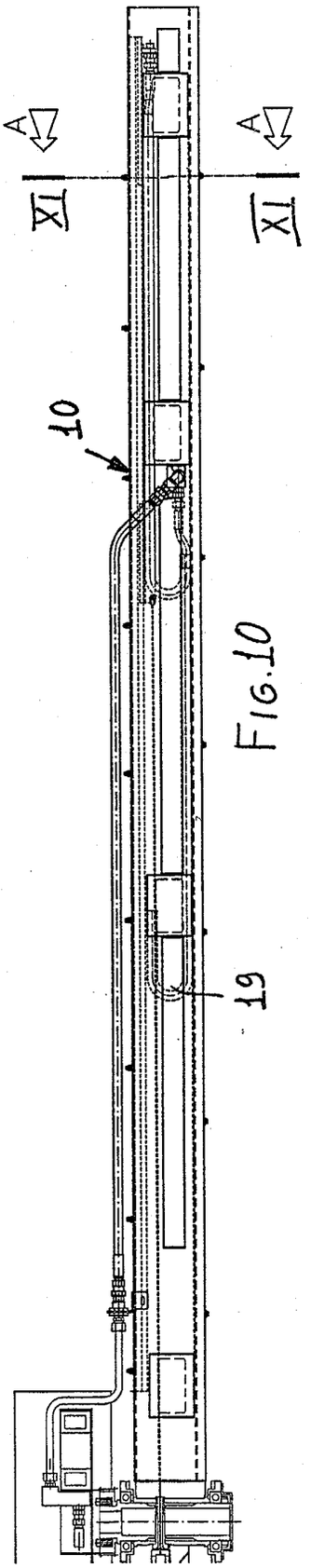

FIG. 10

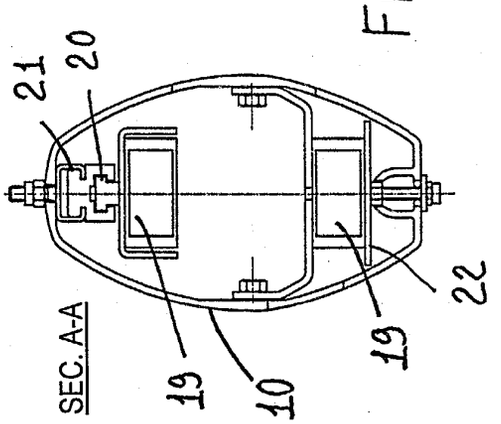

FIG. 11

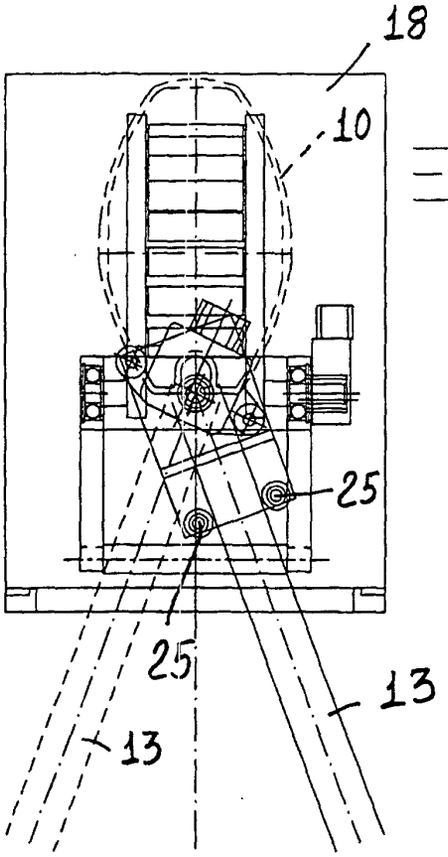

FIG.12

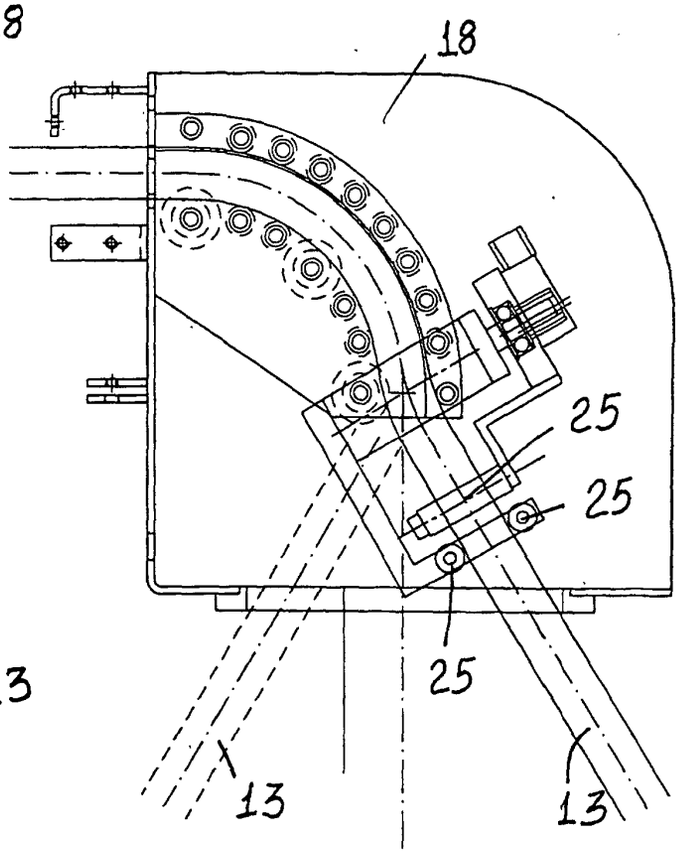

FIG.13

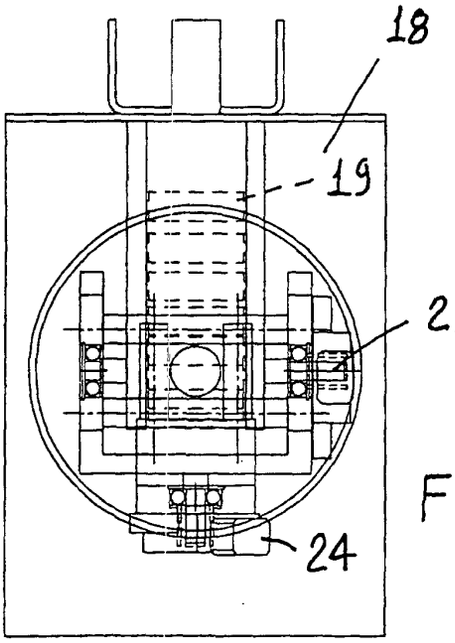

FIG.14