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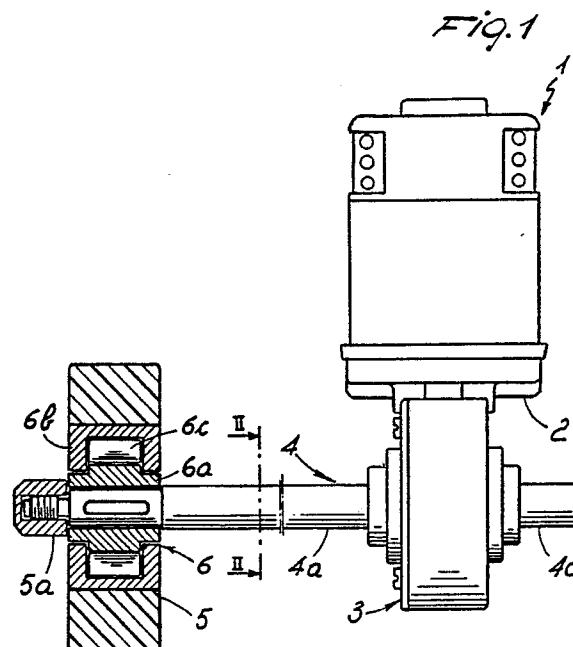
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54 **A drive system for floor and surface sweeping machines.**

57 The invention relates to a drive system for a floor and surface sweeping machine, comprising an electric motor (2), a reduction gear (3) for stepping down the electric motor (2) rpm, two drive wheels (5) placed side-by-side at a distance apart, and two hubs (4a), each engaged coaxially with one drive wheel (5) and led to the reduction gear (3), the hubs (4a) being carried directly on the reduction gear (3) and equally driven rotatively from the reduction gear (3), and between the drive wheels (5) and the hubs (4a) there being inserted two free-wheel mechanisms (6) adapted to permit free rotation of the drive wheels (5) relatively to the hubs (4a) in the same direction of rotation as the hubs (4a) and direction of advance of the sweeping machine.



A DRIVE SYSTEM FOR FLOOR AND SURFACE SWEEPING MACHINES

This invention is related to the technical field of sweeping machines for cleaning large surfaces and floors, and concerns a drive system for such machines.

As is known, there are available on the market sweepers for cleaning floors and the like surfaces which, in their smallest size embodiments, are of the self-propelled type with no control station for the operator who controls the machine from a standing posture while walking behind it.

Such machines are generally fairly compact in size to also enable areas to be cleaned which are hard to get at, such as corners in warehouses or the like. They usually comprise a frame carrying a tank for clean flushing water, a tank for recovered foul water, rotary brushes kept wet by the flushing water, and at least one floor wiping blade, usually made of rubber.

These machines are driven forward by means of a drive system or unit which usually comprises an electric motor, a reduction gear fastened to the electric motor and adapted to step down its rpm, transmission members, and a pair of drive wheels.

The reduction gear is in many instances a unitary construction with the electric motor, called gear motor, and has on its exterior a projection or power take-off to which the transmission members are led. The transmission members usually comprise, in turn, chains or belts, carried on pulleys or sprocket wheels, which receive their motion from the reduction gear power take-off and a differential gear which receives its motion from the chains or belts. From the differential gear there extend two drive hubs for two drive wheels.

These drive members have significant drawbacks.

Particularly the chains or belts may cause slip-page or rough driving unless properly set and held under tension.

It is known to remedy this drawback by means of special devices for holding the belts or chains automatically under tension. However, these devices make the machines in question more complex and heavy, when for such machines, simplicity and low cost may be vital to their commercial acceptance. Accordingly, in some cases, the belts and chains have been tensioned by just moving the axes of the pulleys or sprocket wheels further apart with an adjustment of the axis positions.

In particular, it has been already arranged for the gear motor unit to be initially engaged loosely with the frame, such as by providing slots and bolts passed through said slots. After assembling the belts or chains, the gear motor is shifted to stretch the same and then secured.

The operation must be repeated each time renewed tensioning is made necessary by natural loosening, and specialized personnel is to perform it each time. Thus, maintenance costs are brought about which are often unacceptable with the smallest size machines.

Another approach has been, in order to overcome the above problems, proposed wherein the gear motor unit is moved closer to the differential gear, to thereby produce direct connection of the gear motor to the differential gear and eliminate, accordingly, the need for belts and chains between them. This approach has the drawback of making the construction of the differential gear still more complex, whose provision is quite expensive in the instance of sweeping machines of the type indicated, which are of a much reduced size.

It may be appreciated, in fact, that a differential gear is in itself a costly, relatively heavy, and bulky item of equipment. A differential gear, moreover, detracts from the power delivered to the drive wheels, which power is of a small order of magnitude because supplied by low power electric motors.

Sweeping machines of a small size have already been produced with a drive system including no differential gear and having a kinematic train wherein the belts or chains are led directly to the hubs of the drive wheels. With these machines, a degree of drive wheel slip has had to be accepted in turning.

However, since it is obviously desirable and advantageous that this wheel slipping be prevented, for smoother travel even along twisting and irregular paths, drive systems have also been already designed which, while including no differential gear, can prevent the drive wheels from slipping over the ground.

The drive system may be mentioned, for example, which use a single drive wheel located centrally of the machine, or the ones having either of two wheels as the drive wheel.

The former approach has the drawback of ensuring no adequate stability for the machine, whereas the latter approach implies inaccurate control and poor controllability along straight travel paths.

This being the situation, it is the object of this invention to provide a drive system for floor and surface sweeping machines which can substantially obviate the cited drawbacks.

Within this object it is an important particular object to provide a drive system which, while being simple in construction, inexpensive, light and compact, is highly reliable and durable without requir-

ing maintenance or adjustment or servicing operations.

The objects specified above are substantially achieved by a drive system for a floor and surface sweeping machine, comprising an electric motor, a reduction gear for stepping down the rpm of said electric motor, driven by said electric motor and made unitary therewith, two drive wheels placed side-by-side at a distance apart, and two hubs, each engaged coaxially with one of said drive wheels and led, for a respective rotary drive, to said reduction gear, characterized in that said hubs are carried directly on said reduction gear, that said hubs are equally engaged rotatively with said reduction gear so as to receive an equal rotary drive, and in that between said drive wheels and said hubs there are inserted two free-wheel mechanisms operative to permit free rotation of said drive wheels relatively to said hubs in the same direction of rotation as that of said drive wheels which causes said sweeping machine to be propelled.

Further features will be more clearly apparent from the detailed description of a drive system for floor and surface sweeping machines, as depicted in the accompanying drawings, where:

Figure 1 is a plan view of a drive system according to the invention; and

Figure 2 is a side elevation view of the drive system shown in Figure 1.

With reference to the drawing views, the drive system of this invention is denoted by the numeral 1.

It is provided to drive a floor and surface sweeping machine, known per se, of the type mentioned in the preamble.

The drive system 1 comprises an electric motor 2 coupled directly to a reduction gear 3, thereby forming a compact gear motor unit.

Two parallel drive wheels 5 are provided which are spaced apart from each other and driven rotatively from the reduction gear 3 via a power take-off thereof.

Each drive wheel 5 is engaged coaxially by a respective hub 4a which is advantageously supported on and driven directly from the reduction gear 3.

Originally the two hubs 4a are rigid with each other to form a single drive shaft 4 and said power take-off of the reduction gear 3 is not embodied as a short projection but expanded to itself define the drive shaft 4 which, accordingly, extends through the reduction gear and exits it on opposite faces thereof. The drive shaft 4 is aligned along an orthogonal axis to the direction of movement of the machine, and has on its ends the two drive wheels 5 held in place by screw elements 5a. Advantageously, between each drive wheel 5 and the drive shaft 4 there is provided a free-wheel mechanism 6

which carries externally the drive wheel 5 and is engaged internally by its inside bore with the drive shaft 4.

The free-wheel mechanisms 6 are practically the innermost portions of the drive wheels 5.

Each free-wheel mechanism 6 is of a type known per se and allows, as is known, relative rotation in one direction, and locks in the opposite direction.

Shown in Figure 1 by way of example is a free-wheel mechanism 6 of a type having rollers 6c, with an inner body 6a and an outer ring gear 6b forming shaped cavities wherein the rollers 6c oscillate between a released position and a driving position.

The free-wheel mechanisms 6 are mounted to the drive shaft 4 to make the drive shaft and drive wheel rotatively unitary only when it is the drive shaft that drives the wheels, and to release that drive wheel which in turning happens to be on the outside, thus tending to turn at a higher speed than the drive shaft.

This means that the free-wheel mechanisms 6 are mounted to permit free rotation of the drive wheels relatively to the drive shaft 4 only in the same direction of rotation as the drive shaft 4, coincident with the direction of rotation of the drive wheels 5 which causes the sweeping machine to move forward.

The drive system operates as follows.

The motor 2 delivers power to the reduction gear 3 and the drive shaft 4, which rotates both drive wheels 5 at the same angular velocity.

On turning, the operator will direct the sweeping machine along a desired path and the free-wheel mechanisms allow the drive wheel 5 on the outside of the bend to acquire the necessary overspeed to go through the path without slipping over the ground.

The invention affords important advantages.

In fact, the direct connection of the electric motor 2 and the reduction gear 3, forming a compact gear motor, to a drive shaft 4 carrying the drive wheels 5 makes the drive system a highly compact and light one. This drive system is also quick and simple to assemble, requires no tuning up and reduced maintenance.

The drive system is then characteristically simple, inexpensive, and formed of few members, while affording optimum control conditions even in negotiating small radius bends, the wheels adhering at all times perfectly on the surface being cleaned, by virtue of said free-wheel mechanisms, arranged as taught herein.

The system is therefore particularly suitable for use in the drive of simple small-size sweeping machines.

Claims

1. A drive system for a floor and surface sweeping machine, comprising:

an electric motor (2);

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a reduction gear (3) for stepping down the rpm of said electric motor (2), driven by said electric motor (2) and made unitary therewith;

two drive wheels (5) placed side-by-side at a distance apart; and

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two hubs (4a), each engaged coaxially with one of said drive wheels (5) and led, for a respective rotary drive, to said reduction gear (3);

characterized in that said hubs (4a) are carried rotatably directly on said reduction gear (3);

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that said hubs (4a) are equally engaged rotatively with said reduction gear (3) so as to receive an equal rotary drive; and

that between said drive wheels (5) and said hubs (4a) there are inserted two free-wheel mechanisms (6) operative to permit free rotation of said drive wheels (5) relatively to said hubs (4a) in the same direction of rotation as that of said drive wheels (5) which causes said sweeping machine to be propelled.

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2. A drive system according to Claim 1, wherein said hubs (4a) are rigid with each other and form a one-piece drive shaft (4) extending through said reduction gear (3).

3. A drive system according to Claim 2, wherein said reduction gear (3) has a power take-off to drive said drive wheels (5) rotatively, extended on opposite sides of said reduction gear (3) thereby forming itself said drive shaft (4).

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4. A drive system according to Claim 3, wherein said free-wheel mechanisms (6) are an inner portion of said drive wheels (5), said free-wheel mechanisms (6) being engaged directly with said drive shaft (4).

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