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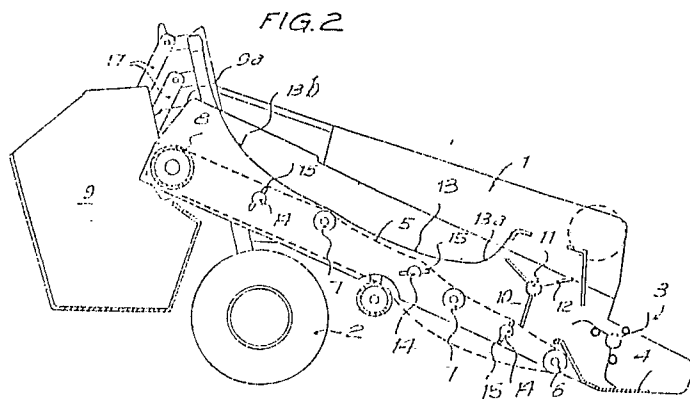
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54 Sand cleaning and stone removing machine.

57 The machine applies to such machines having an endless moving screening mesh (5) to separate sand from foreign matter, a sand collecting ramp (4) and sand beating device (3) at the input end of the screen, and a foreign matter collecting and dumping hopper (9) at the outlet end of the said screen (5). The action of the beating device (3) is completed by a second beating mechanism (10); a flexible cover (13) placed over the screen (5) prevents bouncing of the foreign matter. Vibrating devices are formed of a shaft (14) with revolving blades (15) which strike the screen mesh (5). The hopper (9) is mounted oscillating at the free end of a articulated polygon articulated to an upper portion (16) of the machine frame (1).

It is thereby attained that the stones roll over the screening mesh (5), and the moist, soggy sand is broken up, thus enhancing screening of the sand. Also, the overall height of the elevating mechanism of the hopper (9) is lowered, thus increasing maneuverability.



Description

SAND CLEANING AND STONE REMOVING MACHINE

The present invention relates to machines for cleaning sand, removing stones and other large foreign bodies therefrom and has as its main object to noticeably improve the efficiency of the known machines of this kind.

A further object of the invention is to cut down the bulk of such known machine when in its rest condition, such that it can be lodged in standard transportation containers.

BACKGROUND OF THE INVENTION

A known sand cleaning and stone removing machine comprises a ramp or blade located at its leading end, as regards the direction of motion of the working machine and which sinks itself into the sand and drives it towards the upper run of an endless inclined mesh or screen which is moved continuously in the opposite direction while it is subjected to a vibrating movement. A revolving beating device formed of a plurality of radial arms or fingers issuing from a revolving shaft, is located over the ramp and pushes the stones and large bodies picked up by the machine, towards the screen, this latter leading to a hopper for collecting the stones and bodies larger than a given size as defined by the screen mesh. The hopper is associated with a hopper dumping mechanism, in some instances also raising the said hopper to a given height, for emptying it when full. This ensemble is mounted on a frame endowed with wheels and means for moving it, as well as suitable gearings for driving the endless screen, the beating device, the vibrators and the hopper.

These known machines suffer from several drawbacks.

One drawback resides on the fact that the stones and large bodies which are picked up by the front blade or ramp of the machine, fall back along the screen because they do not receive a momentum enough to ascend up to the hopper. This can be palliated in part by making smaller the slope of the screen, but this solution has the negative effect of reducing the efficiency of the screening mesh, the much so when the matter is with moist sand, which becomes soggy and does not pass through it, thus going up to the hopper.

Another drawback shown by these known machines having a hopper which is to be dumped by means of mechanic or hydraulic elevation mechanism, is that the hopper for the stones and bodies separated from the treated sand, is mounted on vertical props along which the hopper is raised up to a height suitable for discharging its contents in a lorry or container. Such props have a height which is greater than the height of the standard transport containers and raises problems at the time of transporting the machine. It may also occur that the excessive height of the machine surpasses the span of the bridges built over second order highways.

DESCRIPTION OF THE INVENTION

To solve all of the above exposed drawbacks, the invention aims to increase the efficiency of the machine together with a substantial reduction of the height of the hopper elevating mechanism in its rest position.

According to the invention, the machine includes at least a second revolving beating device placed downstream of conventional beating device as regards the upper run of the screening mesh; a flexible and resistant cover over the screening mesh and at a short distance thereof, the dimensions of the cover corresponding to those of the upper or working run of the said screening mesh, the ends of the cover being somewhat more spaced apart from the screening mesh such that the lower end terminates at about the height of the second beating device while the upper end terminates at the upper portion of the hopper loading opening.

A further feature of the invention resides on the fact that the upper working run of the screening mesh, is supported by a plurality of revolving rollers placed transversely to the direction of movement of the said mesh and having a cross section with an elongated outer contour, thus forming opposite protrusions along its whole length, which successively strike the mesh upper run.

In an alternative embodiment, the vibrating devices are formed of revolving rollers provided with longitudinal flanges or clamps securing hard rubber profiles such that they are easily released and replaceable, and successively strike the screening mesh.

In an advantageous embodiment, the hopper in mounted in oscillating position about a virtual axis the ends of which are supported on the ends of side arms integral with a support structure for the hopper, the said arms carrying articulated the ends of two parallel arms, in turn articulated at their opposite ends on the upper portion of the machine frame, thus forming at either side of this latter an articulated polygon for raising the hopper and which is operated by corresponding pressure fluid rams.

To advantage, the oscillation axis of the hopper is located over the center of gravity of the hopper, such that this latter tends to assume the loading position, with its opening at the height of the upper portion of the screening mesh.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the above description, the enclosed drawings show, only by way of non restrictive example, a practical embodiment of the invention. In the said drawings:

Figure 1 is a side elevation view of a sand cleaning machine incorporating the features of the invention;

Figure 2 is a view in longitudinal section of the same machine, showing the position of the screening mesh, the flexible cover, the two beating devices and the rollers striking the upper portion of the mesh;

Figure 3 is a cross section view of one of the rollers with the blades striking the upper run of the mesh; and

Figure 4 is a view in side elevation of the elevating mechanism of the loading hopper, shown in several positions.

DESCRIPTION OF A PREFERRED EMBODIMENT

The features of the invention have been incorporated to a machine formed, in the drawings, of a general frame referred to as 1, endowed with wheels 2 and means, not shown, for connection thereof to a towing tractor, although the machine can be provided with automotive means.

This machine, according to a known embodiment, comprises a leading beating device 3 constituted by radial fingers in the shape of wire springs (Fig. 2), placed immediately above a collecting ramp or blade 4 which sinks into the sand to be treated. The machine is provided, just next to the ramp 4, with a screen 5 constituted by an endless mesh which is suspended over a motor roller 6, several intermediate guide and support rollers 7 and an upper roller 8 placed at the height of a tilting, loading and unloading hopper 9 to which the larger stones and bodies collected by the blade 4 and ascending along the screen 5, are made to go.

It will be understood that the motor roller 8 is driven by any suitable mechanism such that the upper run of the screening mesh 5 moves upwards, that is, from the ramp 4 to the hopper 9. The beating device 3 is made to rotate in the clockwise direction.

According to the invention, a second beating device 10 is located over the lower end of the screening mesh 5, at a short distance of the first beating device 3, and is formed, in a feasible embodiment, of a shaft 11 from which a plurality of elastic blades 12, to advantage made of hard rubber, depart and are located radial along the generatrix of the shaft 11.

A flexible and resistant cover 13 is located over the upper run of the screening mesh 5 and has dimensions corresponding to those of the above said mesh run. The lower end 13a and upper end 13b of the cover are noticeably spaced apart from the mesh 5, whereas the remainder of the cover is located very close to the mesh. The lower end 13a is located somewhat higher than the beating device 10, and the upper end 13b is located over the opening 9a of the hopper 9.

The upper run of the screening mesh 5 rests also onto rotating rollers 14 having elastic blades 15 secured thereto by means of longitudinal clamps 16 departing in secant position from the rollers (Fig. 3), such that, upon revolving, the blades strike abruptly the bottom face of the upper run of the screening mesh 5 at several places along its path, between the support and driving rollers 6,7,8, thus imparting to it

a vibration enhancing the screening action of the mesh and breaking up the soggy sand.

Other rollers, showing in cross section an essentially elliptic outline and lined with hard rubber, could be mounted, according to an alternative embodiment, in place of the above described rollers, and would act just in the same manner as these latter.

The drive of the beating devices 3,10 is performed by means of a pulley and belt gear generally denoted with 17 and located at one side of the machine frame 1, whereas the displacement of the screening mesh 5 and the rotation of the vibrators 14,15 is performed by means of a pulley and belt gear, not shown, located at the opposite side of the frame 1.

The machine frame has two rear uprights 16 at respective sides of the frame, and a respective pair of parallel arms 17 extending from the rear of the machine are articulated on the upper portion of these uprights at one of their ends, whereas the opposite ends of each said pair of arms are articulated to a respective side prop 18. Both props 18 are joined by a crossbar 19, and their upper ends bear respective stub shafts 20 directed to one another and aligned transversely to the machine, upon which the hopper 9 rests in articulated relation by means of complementary bearing members not visible in the drawings. The ensemble thus forms an elevating support for the hopper 9 which can be moved by the articulated polygon mechanism constituted by the uprights 16, arms 17 and props 18, from the working position shown in Figure 1 to the dumping position drawn in solid lines in Figure 4. Thereafter, the hopper 9, in its raised position, can be dumped onto a lorry or container according to the arrow in Figure 4. To advantage, According to a further feature of the invention, the virtual axis formed of the two stub shafts 26 secured to the props 18 and their complementary bearing devices of the hopper 9, is located over the gravity center of this latter.

The pairs of arms 17 are operated by means of pressure fluid rams 21 having one end articulated at a point 22 of the frame 1 and the opposite end articulated at a point or axis 23 located at respective side elbows 24 integral with one of the arms of each pair.

On the other hand, the hopper is dumped by means of single action pressure fluid rams 25 having one end articulated on a point or axis 26 of each arm 18 and the opposite end on a point or axis 27 of the hopper.

Thanks to the described features of the invention, the following advantages are attained as regards the hitherto known machines of this type:

The stones and bodies thrown downstream of the screening mesh by the first beating device 3, are further thrown by the second beating device 10, whose blades 12 push them upwards. It is thus avoided that the larger bodies can roll down over the mesh, thus allowing to increase the slope of this latter and its efficiency as regards the room taken by the screen.

The flexible cover 13 catches the stones, prevent them from bouncing and help in its raising until they

are discharged in the hopper 9 through the opening 9a thereof. On the other side, the said flexible cover damps the noises made by the stones and other bodies in its bouncing within the machine.

The vibrators 14,15 hit in an abrupt and successive manner, twice each complete turn, different transverse sections of the mesh 5 and break up the sand entering in a soggy condition in the machine thus contributing to the cleaning and screening of the same.

The rubber blades 15 of the vibrators 14,15 can be replaced when they become worn away.

These vibrators 14,15 surpass to advantage the hitherto known vibrators which are formed by off-center rollers giving to the mesh an undulating movement rather than sudden blows, which is not enough to break up the sand.

The raising ensemble constituted by the pairs of articulated arms 17, which together with the props 18 and the upper portions of the uprights 16 form respective articulated polygons, provides for placing the hopper 9 at the suitable height for dumping the contents thereof in the box of a lorry or the like (Fig. 4) although the height of the machine frame does not practically surpass the overall height of the frame when the hopper occupies its lower position (Fig. 1 and 2). This is important because the machine has a maximum overall height noticeably lower than the hitherto known machines, such that it can be lodged within standard height containers for its transportation.

The machine allows also, by slightly moving the arms 17 of the machine frame a short distance from the uprights 16, to dump the hopper 9 at a small height over the floor, as indicated in dot lines on the bottom half of Figure 4.

It is also worthy of being outlined the easiness with which, by using single action rams, the hopper 9 recovers its loading position when its contents has been dumped, because the rotation virtual axis of the hopper, formed by the stub shafts 26, is located over the center of gravity thereof, such that the said hopper tends to reassume its stable loading position.

Claims

1. A sand cleaning, stone removing machine, of the type comprising a ramp or blade (4) located at its leading end, as regards the direction of motion of the working machine and which sinks itself into the sand and drives it towards the upper run of an endless inclined mesh or screen (5) which is moved continuously in the opposite direction while it is subjected to a vibrating movement, a revolving beating device (3) formed of a plurality of radial arms or fingers issuing from a revolving shaft, located over the ramp to push the stones and large bodies picked up by the machine, towards the screen, this latter leading to a hopper (9) for collecting the stones and bodies larger than a given size as defined by the screen mesh, the hopper (5) being associated with a hopper

dumping mechanism, in some instances also raising the said hopper to a given height, for emptying it when full, this ensemble being mounted on a frame (1) endowed with wheels and means for moving it, as well as suitable gearings for driving the endless screen (5), the beating device (3), the vibrators (14) and the hopper (9), the machine being characterized in that it includes:

at least a second revolving beating device (10) placed downstream of the conventional beating device (3) as regards the upper run of the screening mesh (5);

a flexible and resistant cover (13) over the screening mesh (5) and at a short distance thereof

; the dimensions of the cover (13) corresponding to those of the upper or working run of the said screening mesh (5), the ends of the cover (13) being somewhat more spaced apart from the screening mesh (5) such that the lower end (13a) terminates at about the height of the second beating device (10) while the upper end (13b) terminates at the upper portion of the loading opening (9a) of the hopper (9).

2. A machine according to claim 1, characterized in that the upper working run of the screening mesh (5), is supported by a plurality of revolving rollers (7,14) placed transversely to the direction of movement of the said mesh, at least some of the said rollers (14) having a cross section with an elongated outer contour, thus forming opposite protrusions along its whole length, which successively strike the upper run of the screening mesh (5) thus forming vibrator devices for vibrating the material placed upon it.

3. A machine according to claims 1 and 2, characterized in that the vibrating devices are formed of revolving rollers (14) provided with longitudinal flanges or clamps (16) securing hard rubber profiles (15) such that they are easily released and replaceable, and successively strike the screening mesh (5).

4. A machine according to claim 1, characterized in that the hopper (9) is mounted in oscillating position about a virtual axis the ends (20) of which are supported on the ends of side members (18) being a part of a support structure (16,17,18) for the hopper (9), the said members (18) carrying articulated the ends of two parallel arms (17) in turn articulated at their opposite ends on the upper portion (18) of the machine frame (1), thus forming at either side of this latter an articulated polygon (16,17,18) for raising the hopper and which is operated by corresponding pressure fluid rams (21).

5. A machine according to claims 1 and 4, characterized in that the hopper (9) is mounted for oscillation about the axis (20) which is located over the center of gravity thereof, such that the said hopper (9) tends to assume its loading position, with its opening (9a) at the height of the upper portion of the screening mesh (5).

FIG. 1

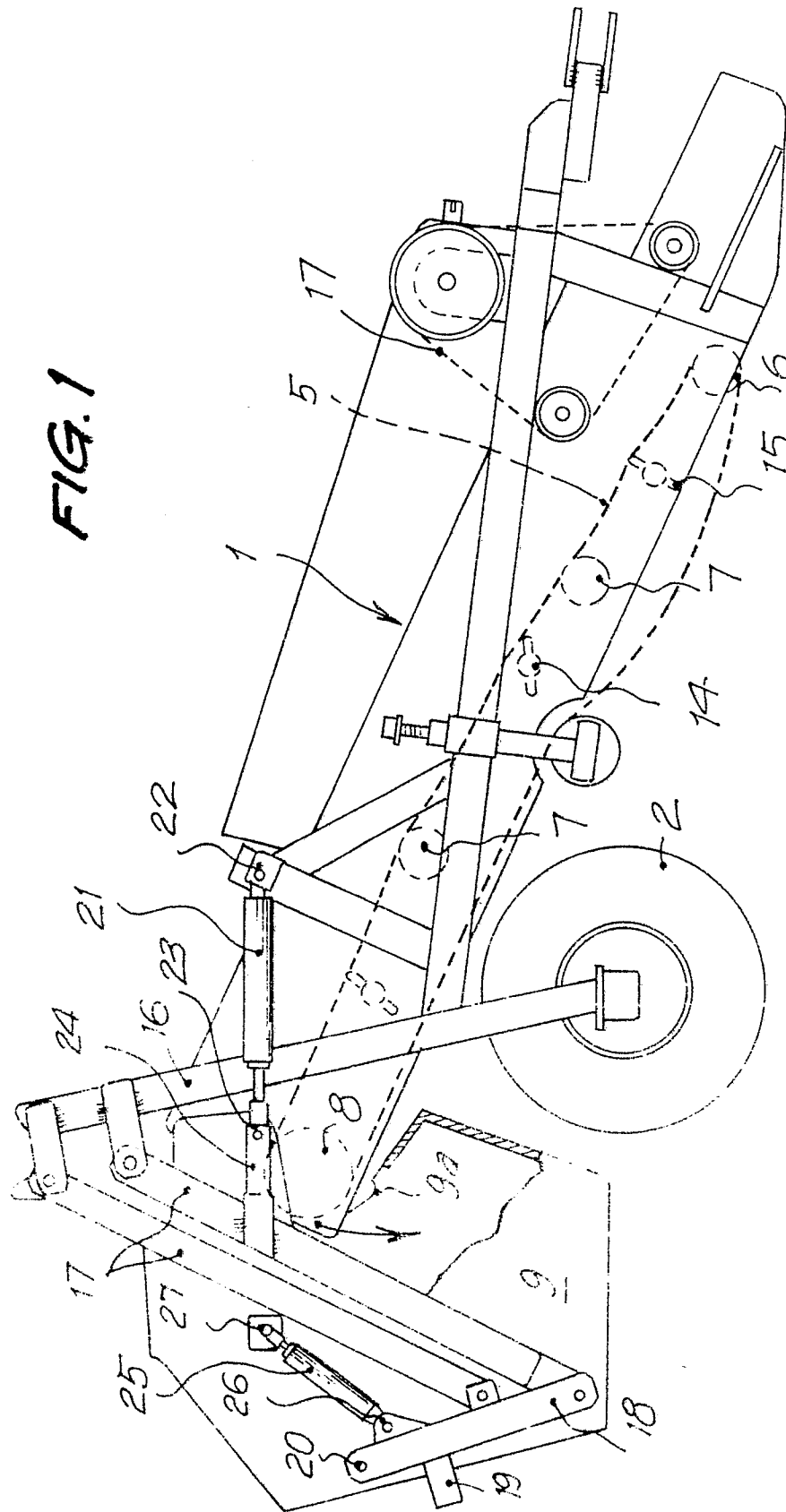


FIG. 3

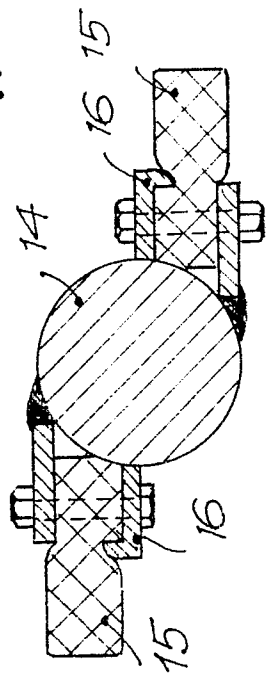
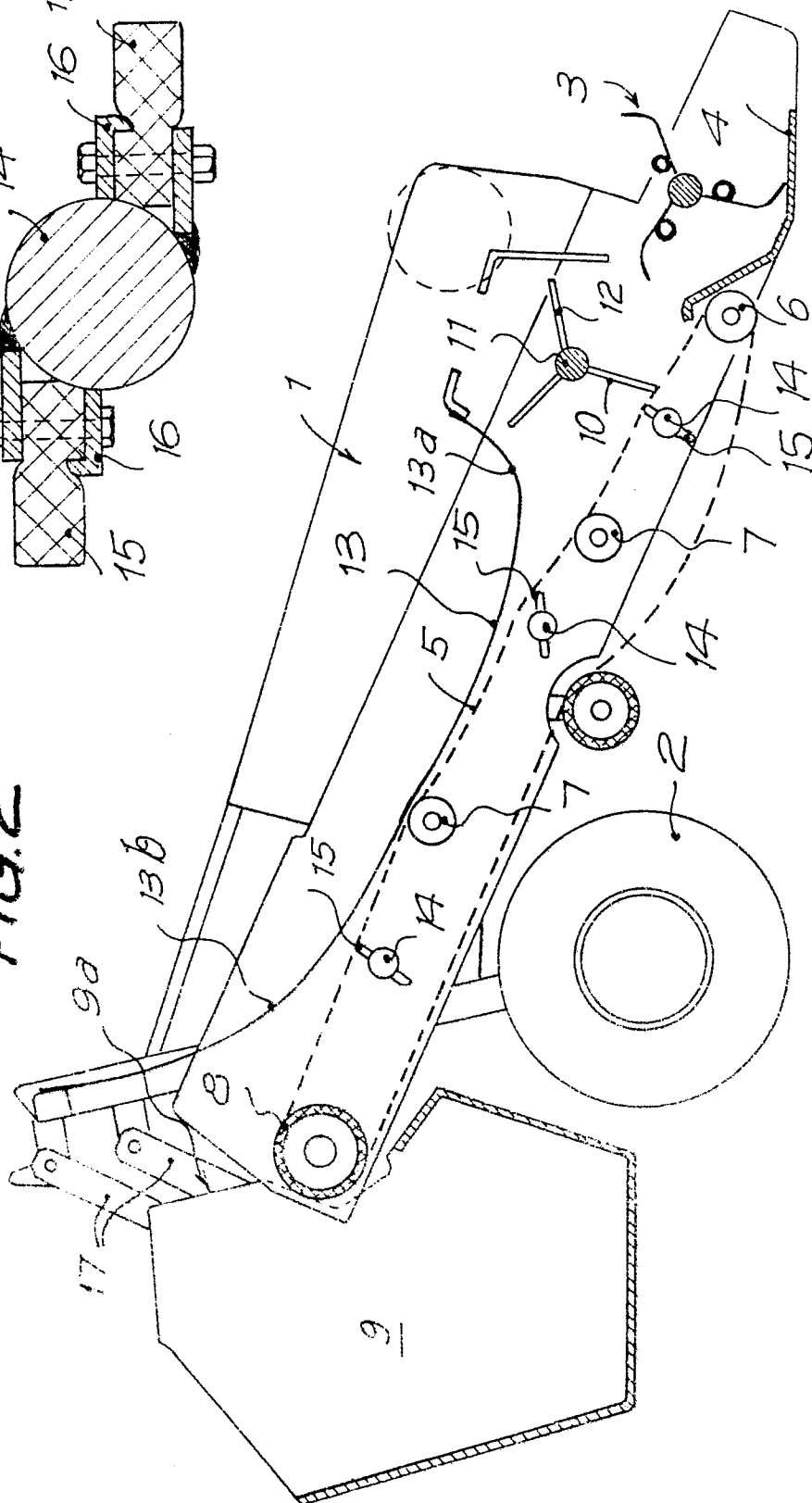
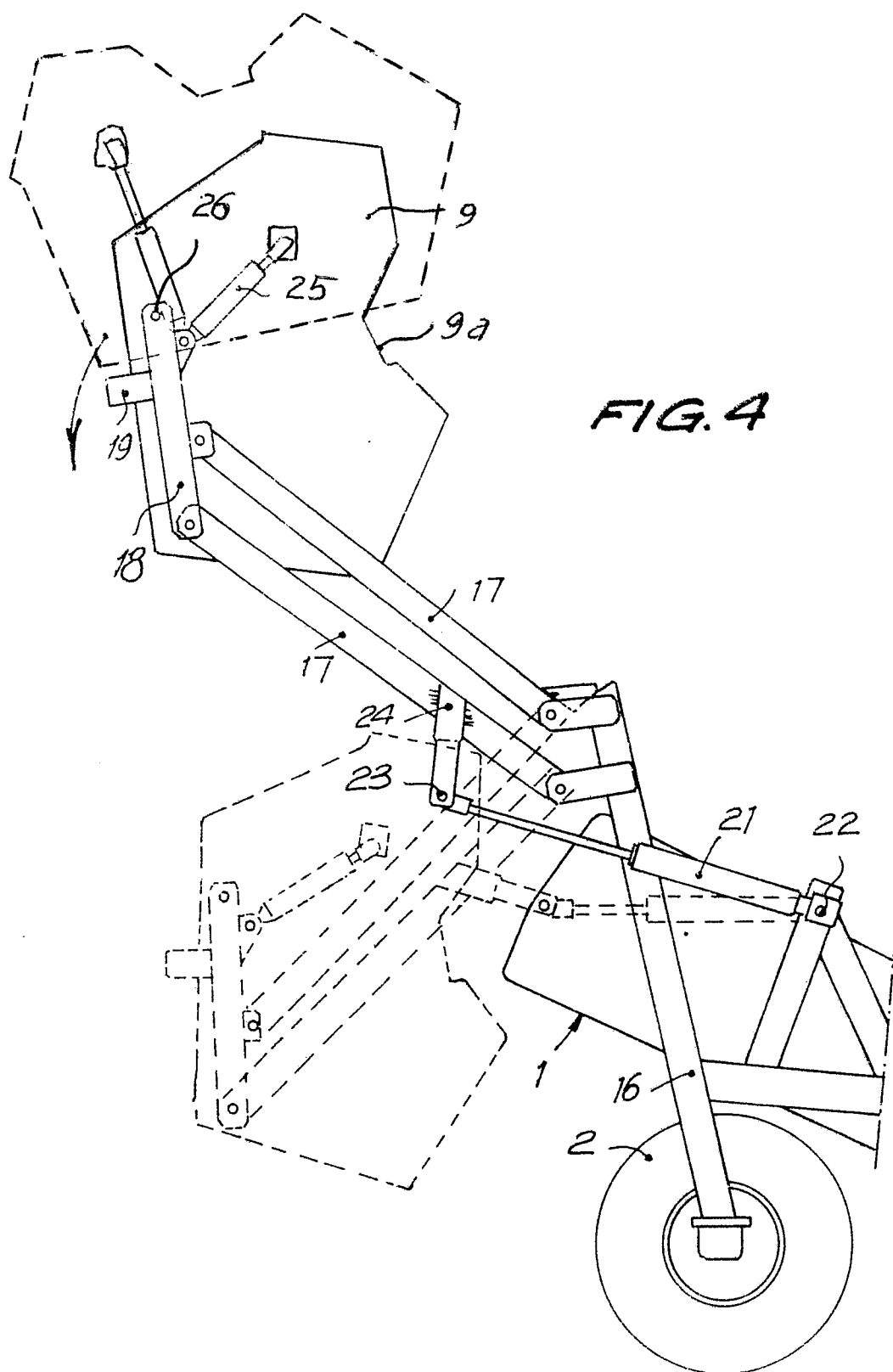


FIG. 2







DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	FR-A-2 335 142 (PICKERTON ENGINEERING) * Page 2, line 23 - page 5, line 22; figures * ---	1	E 01 H 12/00
A	US-A-3 828 534 (McROBERT) * Figure 2 * ---	1	
A	US-A-4 642 977 (RAMACHER) * Column 2, line 13 - column 3, line 29; figures * ---	1	
A	US-A-4 221 265 (PRATT) * Whole document * ---	1	
A	FR-A-1 584 170 (UNION MERIDIONALE AGRICOLE) * Whole document * ---	1,2	
A	FR-A-2 554 141 (MANSBRIDGE) * Page 3, line 1 - page 5, line 2; figures * ---	1	
A	US-A-4 608 725 (JACKSON) -----		
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int. Cl.4) E 01 H A 01 B A 01 D
Place of search THE HAGUE		Date of completion of the search 12-09-1989	Examiner DIJKSTRA G.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			