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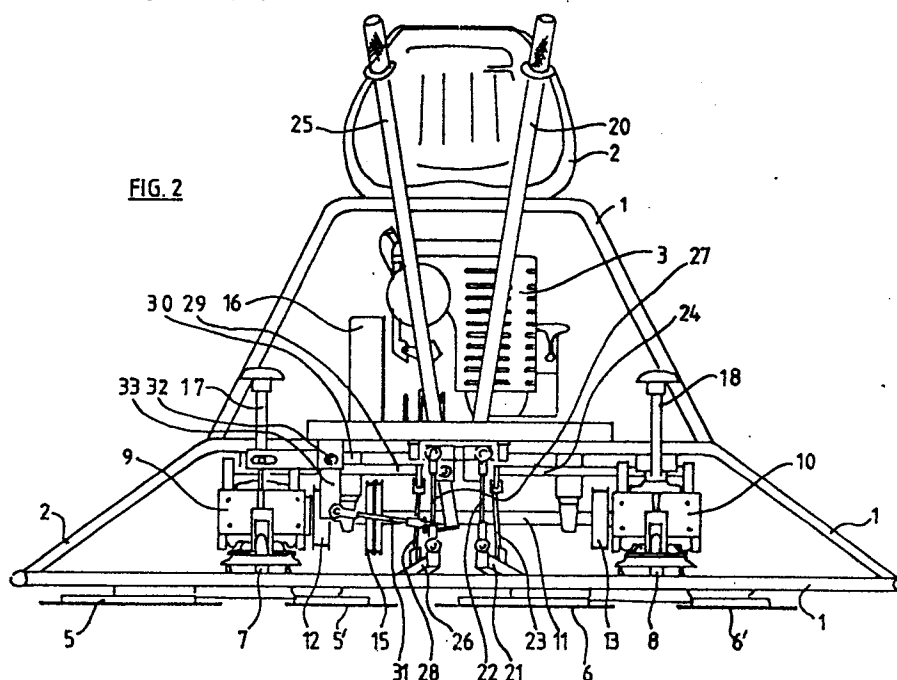
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Machine for the smoothing of concrete surfaces.

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A machine for the smoothing of freshly poured concrete surfaces, consisting substantially of a horizontally displaceable frame (1) with fastening and mounting points for two sets of rotating trowels - (5,5',6,6'), each set being attached perpendicularly to the end of the tiltable rotating shaft (11).



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Machine for the smoothing of concrete surfaces.

The invention relates to a machine for the smoothing of freshly poured concrete surfaces, consisting substantially of a horizontally displaceable frame with fastening and mounting points for

(a) two sets of trowels, each set being attached perpendicularly to the end of a rotating shaft, which trowels can be made to work the freshly poured concrete surface in a rotary motion, the said shaft being capable of a tilt from the vertical, whilst the effective ranges of the trowels overlap;

(b) an engine drive capable of making the sets of trowels rotate synchronously and in opposite directions;

(c) means of positioning the rotating shafts with at least one operating lever in a desired tilt relative to the vertical;

(d) a seat from which the lever(s) and the engine drive can be operated; and

(e) means of vertically adjusting each set of trowels relative to the frame.

The machine is characterized in that it is self-propelled and that the operator can occupy a seat thereon and move the machine in a direction which is required for the smoothing of the concrete surface to be worked.

A machine of this type is known from U.S. Patent No. 4 046 484. In it, the propulsion and the concurrent smoothing of a freshly poured concrete surface take place by slightly tilting the sets of rotating trowels symmetrically and/or systematically relative to one another round their axis of rotation. Figures 6 -11 of U.S.P. 4 046 484 show that in this manner a forward, backward and lateral or rotary movement can be accomplished. This design permits a large concrete surface to be treated quickly, indeed much faster than can be done with a manually propelled rotating set of trowels which involves the necessity of "obliterating" footsteps on the fresh concrete.

The aforesaid known machine has two disadvantages:

(a) both rotating shafts are linked according to a certain system and are adjustable in all directions relative to the vertical. Now it has been found that this design is unduly complex and that it suffices to have the shaft of one set of trowels only adjustable relative to the vertical according to a plane crosswise to the forward or backward movements, whereas only the other shaft is adjustable in all positions relative to the vertical;

(b) between the drive engine and the rotating shafts of the sets of trowels there is no clutch provided which slides into engagement only at a predetermined torque to be transmitted. Only the

presence of such a clutch precludes the risks of the trowels stalling and the engine cutting out and ensures a consistently optimum operation of the smoothing trowels.

The machine described in the introductory paragraph is therefore characterized in that

(a) one of the driving shafts of the two sets of trowels is adjustable by means of a lever relative to the vertical in a plane crosswise to the rectilinear forward movement;

(b) the second driving shaft of the two sets of trowels is adjustable by means of a second lever in any desired position relative to the vertical; and

(c) between the drive engine and the mechanism of the rotating shafts of the two sets of trowels a clutch is provided which slides into engagement at a certain predetermined torque to be transmitted.

It has been found that the machine instantly works with optimum efficiency as soon as the clutch engages. The propulsion and the rate thereof (also in reversing) are controlled by the simultaneous manipulation of the two levers (or control sticks), and a lateral or rotary movement can be performed by shifting the appropriate lever to the desired position. The velocity of the movements may, in addition, be influenced by the position of the other lever.

The invention will now be elucidated with reference to the drawings which represent the machine in a simplified form, of which

Figure 1 is a side view, and

Figure 2 is a front view according to arrow A of Figure 1.

All component parts are attached to a frame 1, supporting a seat 2 for the operator and a drive engine 3 with fuel tank 4. Each set of trowels 5, 5', 5" and 6, 6', 6" is horizontally fitted to vertically adjustable shafts 7 and 8, respectively. These shafts are driven through transmission gear cases 9 and 10, respectively, whereby the horizontal rotation of shaft 11 is converted into the vertical rotation. Shaft 11 actuates the gears 9 and 10 through toothed drive belts 12 and 13, respectively, which are provided with tightening pulleys. This set-up ensures synchronous operation of the two sets of trowels, whilst leaving scope for some measure of operational mobility. It is this embodiment which must be considered largely essential for the invention since a smooth adjustability while preserving the desired synchronization is imperative.

Shaft 11 is driven by the engine 3 through a belt 14 looped round a pulley 15 and through an adjustable centrifugal clutch 16.

The two sets of trowels 5, 5', 5" and 6, 6', 6" are vertically adjustable together with their shafts 7, 8 and transmission gear cases 9, 10 by means of set screws 17 and 18.

The set of trowels 6, 6', 6" can be tilted from the vertical in the plane of the view according to Figure 1 by means of a control lever 20 to be operated from the seat 2. This is effected by moving a lever 21 through a tie rod 22 with a fixed hinge point 21', which movement is transmitted with the aid of a tie rod 23 through a hinge point to a rocker shaft 24 which can tilt the case 10 with shaft 8 and trowel blades 6, 6', 6" perpendicularly to the plane of projection of Figure 2. The arrangement is indicated somewhat schematically, because several embodiments of this mechanism, other than the one here specified, can be conceived without detracting from the essence of the invention. One conceivable mode of transmission could utilize a Bowden cable.

The same mechanism is provided for the other set of trowels 5, 5', 5", comprising control lever 25, lever 26, tie rods 27 and 28 and rocker shaft 29, for tilting the case 9, shaft 7 and the trowel blades 5, 5', 5" in the aforesaid plane.

The control lever 25 can, in addition, be shifted in a direction perpendicular to the one first mentioned. A shift in this direction gives rise to the activation of a shaft 30, which makes it possible to tilt case 10, shaft 7 and the trowels 5, 5', 5" in a plane parallel to that of the projection according to Figure 2. To this end, a rod 31 which is linked to an extension of the control lever 25 acts in concert with a lever 33 which hinges on shaft 32 and which is connected to case 9. Again, the system of this shift mechanism is not compulsorily bound up with the embodiment here specified, as stated hereinbefore.

An essential feature of the invention is that the means of adjustment of the shift mechanisms for the trowels to be positioned are not interconnected and are not movable relative to one another according to a systematic pattern of motions, whilst nonetheless the trowels rotate synchronously vis-à-vis one another in a smooth and adjustable mode of operation through the toothed belts 12 and 13 on motive power derived from the common shaft 11. The design incorporates a simple operating system for a set of trowels 6, 6', 6" and only a straightforward extension for the more complex range of movements to be performed by the set of trowels 5, 5', 5". A further essential feature of the invention is that the clutch 16, in this embodiment a centrifugal clutch, drives the trowels synchronously, but not until a predetermined torque to be transmitted has been attained.

Claims

1. A machine for the smoothing of freshly poured concrete surfaces, consisting substantially of a horizontally displaceable frame with fastening and mounting points for

(a) two sets of trowels, each set being attached perpendicularly to the end of a rotating shaft, which trowels can be made to work the freshly poured concrete surface in a rotary motion, the said shaft being capable of a tilt from the vertical, whilst the effective ranges of the trowels overlap;

(b) an engine drive capable of making the sets of trowels rotate synchronously and in opposite directions;

(c) means of positioning the rotating shafts with at least one operating lever in a desired tilt relative to the vertical;

(d) a seat from which the lever(s) and the engine drive can be operated; and

(e) means of vertically adjusting each set of trowels relative to the frame,

characterized in that

(a) one of the driving shafts (18) of the two sets of trowels (5, 5', 5" and 6, 6', 6") is adjustable by means of a lever relative to the vertical in a plane crosswise to the rectilinear forward movement;

(b) the second driving shaft (17) of the two sets of trowels is adjustable by means of a second lever (25) in any desired position relative to the vertical; and

(c) between the drive engine (3) and the mechanism of the rotating shafts (7,8) of the two sets of trowels (5, 5', 5" and 6, 6', 6") a clutch (16) is provided which slides into engagement at a certain predetermined torque to be transmitted.

2. A machine according to claim 1, characterized in that the clutch (16) is a centrifugal clutch.

3. A machine according to claims 1 and 2, characterized in that the two driving shafts (7,8) of the sets of trowels (5, 5', 5" and 6, 6', 6") are operated synchronously through a transmission mechanism (9,10) by self-tightening toothed belts (12, 13) on motive power derived from a common actuation shaft (11) connected after the clutch (16).

4. A machine according to any one of the preceding claims, characterized in that the shaft (8) which is movable in one direction can be adjusted by the control lever (20) and the assembly of rods which are hinge-jointed thereto besides being mutually hingeable (22, 21, 23) and the rocker shaft (24) through the gear case (10) and that the shaft (7) which is movable in two directions relative to the vertical position can be adjusted in one direction by the control lever (25) and the first hinge-jointed assembly of rods (24, 26, 31) and the

shaft (30), whilst it can also be adjusted in a direction perpendicular thereto through an additionally connected rod (31), the lever (33) and the gear case (9).

5. A machine according to any one of claim 1-3, characterized in that the gear case (10) with the shaft (8) can be tilted in a vertical plane by means

of a Bowden cable and that the case (9) with the shaft (7) can be tilted in two planes perpendicular to one another by means of two Bowden cables.

6. A machine according to any of the preceding claims, as described and elucidated with reference to a drawing.

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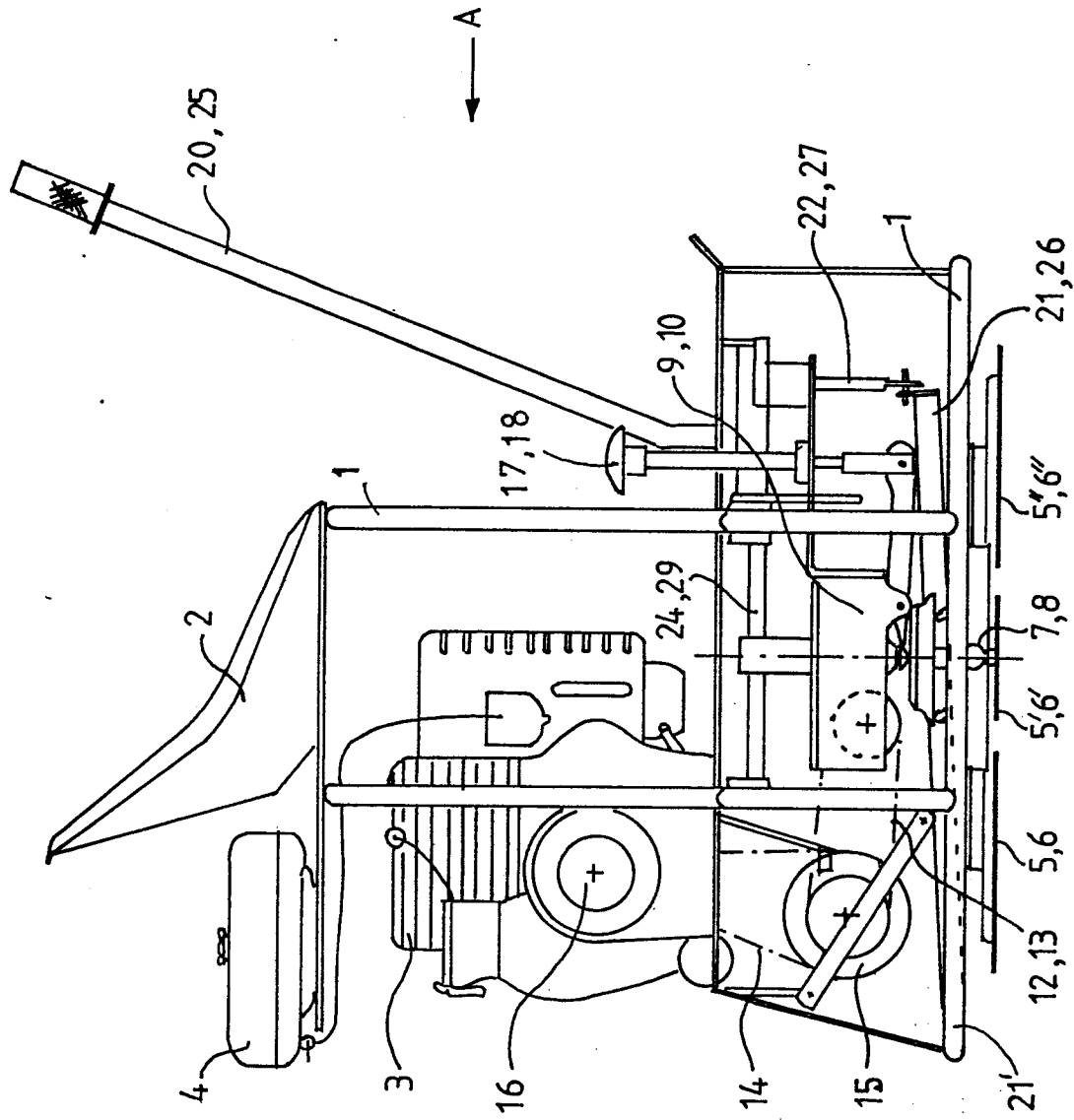


FIG. 1

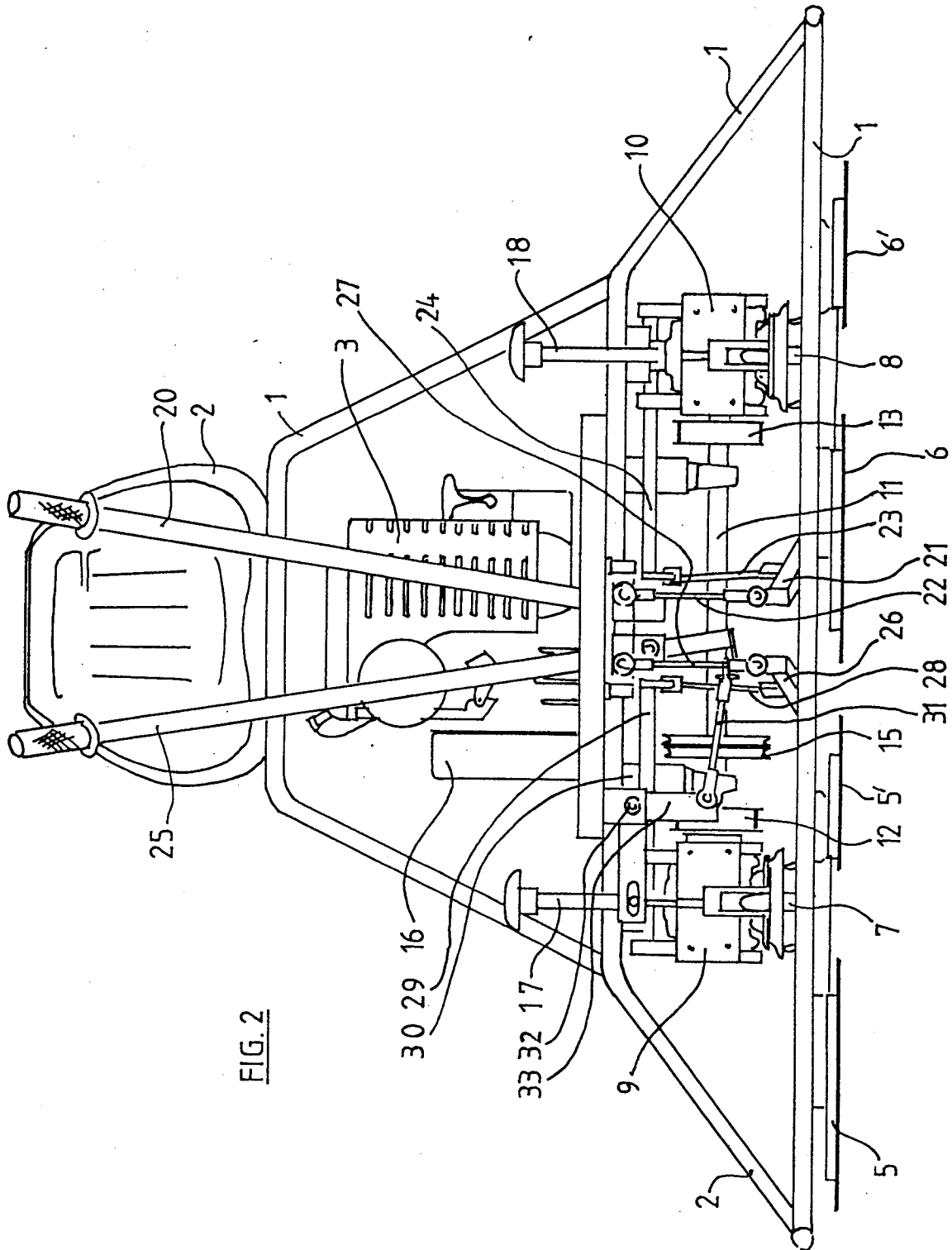


FIG. 2



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)
D, A	US-A-4 046 484 (HOLZ) * Column 3, line 1 - column 8, line 33; figures 1-11 *	1, 3, 4	E 04 F 21/24 E 04 G 21/10
A	FR-A-1 152 959 (COMPTOIR D'OUTILLAGE ET DE FOURNITURES INDUSTRIELLES) * Page 1, left-hand column, line 17 - page 1, right-hand column, line 13; figures 1, 2 *	1, 3	
A	US-A-2 942 536 (WILFRED) * Column 2, line 25 - column 4, line 47; figures 1, 2 *	1, 5	
A	FR-A-2 186 575 (HOLZ et al.)		
			TECHNICAL FIELDS SEARCHED (Int. Cl. 4)
			E 04 F E 04 G
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 01-12-1986	Examiner AYITER J.
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	