This invention relates to an improved lightweight self-propelled machine for striking off and leveling freshly poured concrete floors, slabs, and the like, such machines being generally known as screeding machines.

Prior known screeding machines, which were capable of leveling slabs of relatively great width such as twenty feet or more, have included a complicated heavy rigid structure in order to suitably mount the means for leveling the concrete. Such prior screeding machines often required special equipment to transport them to and from a job. On highway or road paving jobs, the screeding machines were sometimes associated with the concrete pouring machine. Such prior proposed screeding machines often included specially formed rolls including selected longitudinal taper, sections of different diameters and various other means associated therewith to facilitate leveling and compacting the freshly poured concrete. None of these prior machines were adaptable to slabs of greatly different widths. They were expensive, cumbersome, and difficult to operate and maintain.

This invention contemplates a simply constructed, self-propelled non-rigid screeding machine capable of adaptation to slabs of various widths and capable of efficiently leveling, vibrating, compacting and smoothing such slabs so as to provide a virtually flat surface. The screeding machine of this invention is capable of advancing and regressing over the concrete to be leveled in order to further work the concrete if desired. The screeding machine of this invention is capable of working the concrete to a virtually uniform density throughout the width of the slab, of efficiently and effectively floating fines to the surface of the concrete, and of providing a virtually flat surface.

The primary object of this invention is to design and provide an improved lightweight, self-propelled screeding machine which is simply constructed and which is efficient and effective in operation.

Another object of this invention is to design and provide a screeding machine which is readily adaptable to freshly poured concrete slabs of various widths.

Another object of this invention is to design and provide a lightweight, self-propelled improved screeding machine which is capable of propelling itself forwardly, and of propelling itself rearwardly in order to make a selected number of passes over the concrete being worked.

A further object of this invention is to design and provide an improved screeding machine which may readily be assembled and disassembled to adapt the machine to concrete slabs of different width and which requires a minimum of maintenance.

Generally speaking, the screeding machine of this invention includes a pair of parallel, transversely spaced longitudinal end frame means which are interconnected by a plurality of roller means, at least three in number. At least one of the three roller means is driven in a direction so as to advance the screeding machine along the concrete slab. A front roller is driven in an opposite rotary direction and is normally spaced slightly above screed rails in operation so as to initially contact and work the concrete which is being leveled. An intermediate roller is supported from the end frame means for vertical adjustable movement, and normally rollably engages the screed rails when the machine is advancing. When the machine is regressing, the intermediate roller is lifted by suitable lever means so that the oppositely rotating front roller may engage the screed rails for driving the machine backwards. The front roller is normally driven at a considerably higher rate of speed than the roller advancing the machine along the screed rails. Power means for driving the rollers are carried by the end frame means and are provided with driving connections to associated rollers outboard of the frame means.

Other objects and advantages of this invention will be readily apparent from the following description of the drawings.

In the drawings:
Fig. 1 is a top plan view of a screeding machine embodying this invention.
Fig. 2 is a side view of a machine embodying this invention.
Fig. 3 is an end perspective view of the mounting of two of the rollers employed in the machine shown in Fig. 1.
Fig. 4 is a fragmentary end view of the stub shaft mounting of an end of a roller.

An exemplary screeding machine embodying this invention is generally indicated at 10 and includes end frame means 11 and 12 and a plurality of longitudinally spaced, transversely extending, readily removable roll means generally indicated at 13, said roll means interconnecting the end frame means and being journaled supported therefrom. The roll means are adapted to rollingly contact the top edges of spaced screw rails or members 14, and to extend slightly therebeyond. For example, when the machine is used
on a concrete slab of a width of twenty feet, the length of the roll means 13 may be approximately twenty-two feet so as to provide a foot overhang at each end. The end frame means 11 and 12 comprise a pair of spaced parallel, longitudinally extending side frame members 15, each side member 15 bearing an angle section and including a top inboard directed flange 16 and a depending web 17.

The roll means 13 includes a rear driven roller 20, an intermediate driven roller 21 and a front leveling roller 22 each having lower faces tangential to the web 17. Each roller 20, 21 and 22 may be formed of hollow pipe of suitable diameter, preferably about four to five inches. The opposite ends of rollers 20, 21 and 22 are each provided with an outwardly extending stub axle 23 which may be fixedly mounted in a pair of axially spaced ported discs 24 and 25. The stub axle 23 may provide a cover for the open end of the pipe roller. Each stub axle 23 is approximately coaxial with the axis of the associated roller, that is, ample tolerance is permitted and affords a very slight eccentricity for providing some vibration of the rollers and machine during operation.

The ends of front and rear rollers 22 and 20 are carried by the side members 15 in a vertically the same manner and for the purposes of brevity, only one of such end mountings will be described. Each stub axle 23 projects outwardly below and beyond the lower edge of depending web 17 of side member 15 and extends through a port 28 provided in a vertical leg 29 of an angle bracket 30. The angle bracket 30 includes an outwardly extending horizontal leg 31 to which may be suitably secured bearing means 32 axially aligned with the axis of port 28. The bearing means 32 centrally receives the outer portion of stub axle 23.

Each angle bracket 30 is adjustably secured to side member 15 by spaced bolt and nut assemblies 33 extending through web 17 and through upwardly directed open-ended spaced slots 34 provided in the upper portion of the vertical leg 29. Thus, the support of the front and rear rollers from the side members 15 permits relative adjustment, if desired, between the two rollers with respect to the side members 15 by selective positioning of angle brackets 30 with respect to the nut and bolt assemblies 33. The open-ended slots 34 permit each of these rollers 20 and 22 to be readily removed from the side members 15 by merely loosening the nut and bolt assemblies 33 and lifting the side members 15 upwardly so that the bolt assemblies 33 will clear the top open ends of slots 34.

The intermediate roller 21 is journalously supported in proximity to the front roller 22 by angle brackets 35 carried by side members 15, each angle bracket 35 carrying a bearing means 37 suitably secured to a horizontal, outwardly extending leg 38. The brackets 35 are vertically movably supported and pivotally movable supported from side members 15 by a pair of spaced, vertically extending, closed end slots 39 formed in the vertical leg 40 of each bracket 35, said slots 39 receiving the bolts of bolt and nut assemblies 42 which extend through the depending web 17 of each side member 15 thereby permitting the intermediate roller 21 to vertically move and is limited in vertical movement by the abutment of the ends of slots 39 against the bolts of bolt and nut assemblies 42.

Means to adjustably, vertically position the in-
termediate roller 21 so as to either lift the front, levelling roller 22 out of contact with the screed rails, as in normal operation, or to lower the front roller 22 into contact with the screed rails for causing the machine to move backwards. Means to adjustably vertically position the lever 44 against the bolt and nut assembly 42 carried by the end frame member 11 which is adapted to bear against and rollingly contact the top edge of an associated bracket 45. The up-
standing element 46 carries a stop lug 47 related to the pivotal connection 45 of lever 44 so as to position the lever in slightly vertical offset relation when the intermediate roller 21 is urged to its lowest position by the lever 44. The stop lug 47 thus serves to hold or lock the roller in such position. When the intermediate roller 21 is in its lowest position, the front roller 22 is in contact with the screed rails 14 and the intermediate roller 21 will rollingly contact the screed rails 14. Since the front roller 22 is driven in opposite rotation from that of the rear roller 20, the front roller 22 may serve to move the machine backwards, as later described.

The rear and intermediate rollers 20 and 21 may be rotatorily driven so as to advance the machine along the screed rails 14. It is understood, of course, that the intermediate roller 21 need not be driven if so desired, and that the rear roller 20 may be the only roller driving the machine forward.

Power means for driving the rear roller 20 may include a suitable gas-operated motor 50. The motor is supported from end frame means 11 by a suitable motor mounting plate connected to end frame means 11 and to which the motor 50 is adapted to be bolted. The drive shaft of the motor 50 is connected to well-known clutch means 51 for selectively engaging or disengaging the drive shaft. A power transmitting system generally indicated at 52 may include suitably arranged pulley and belt drive means, a reduction gear means 52a, and a sprocket and chain means including a sprocket 53 carried by an extended portion of an adjacent stub axle 23 of the rear roller 20. A clutch means 53c on the output of gear means 52a is operable to engage and disengage the sprocket opposite sprocket 53 for permitting idling of the rear roller 20 and intermediate roller 21.

At the other end of rear roller 20 the associated stub axle 23 may carry a pulley 54 which may be suitably connected by a belt to a pulley 55 carried by the associated stub axle 23 of the intermediate roller 21. Means for driving the front roller 22 in a direction opposite to that of drive rollers 20 and 21 may comprise a second motor means 56 carried by end frame means 12 and having a sprocket generally opposite to motor means 50. The motor means 58 has a drive shaft connected through suitable clutch means 59 to a power transmitting system generally indicated at 60 for transmitting power.
through a pulley and gear arrangement to a pulley 61 carried by the associated stub shaft 23 at one end of the front roller 22.

In operation, it should be noted that the intermediate rollers are in lowermost position and held therein by the levers 44. In lowermost position, the side frame members are supported from the screed rails by the rear and intermediate rollers while the front levelling roller is lifted above the screed rails a distance of about one-eighth of an inch. The motor 50 may be operated so as to advance the machine along the screed rails at a selected speed by rotatably driving the rear roller 26 and the intermediate roller 21. The motor 53 drives the front levelling roller 22 at a selected, relatively high rate of speed as compared with the rear driving roller 21 and is rotated in a direction opposite to the direction of rotation of the rear roller. The machine is thus driven along the screed rails by the driven rear and intermediate rollers while the front levelling roller in its opposite rotation serves to spread, level, agitate and compact freshly poured concrete as it advances thereover.

The speed selected for rotation of the front levelling roller depends upon the stiffness of the concrete mix and may be varied. If the concrete mix is relatively stiff, the speed of the front levelling roller should be increased so that vibration of the roller will also be increased and thereby tend to more effectively spread, vibrate and compact the freshly-poured concrete. The rear and intermediate rollers will then be capable of finishing the surface of the concrete in rough form and to screed height. With normal mixes which are not very stiff, usually one pass of the screeding machine in the invention over the concrete mix is sufficient to give a desired rough finish and a slab of concrete of uniform density.

When it is desired to make more than one pass over the freshly poured concrete or to move the machine backwards, the clutch means 56 for motor 50 may be disengaged so that the rollers 20 and 21 may idle. Levers 44 may then be released to allow the intermediate roller 21 to return to an uppermost position and thereby lower the front levelling roller into contact with the screed rails. Since the front roller is rotating in a direction opposite to the advancement of the screeding machine, the machine will be driven rearwardly by the front roller.

If, during operation, there is a tendency of the screeding machine of this invention to weave on one side or the other of the screed rails or to travel at an angle to the desired path of movement of the machine, the lever 44 on the side of the machine most advanced may be partially released so as to lower the adjacent side of the front levelling roller into contact with the screed rail. The operation of rotation of the front levelling roller tends to counteract forward movement of that side of the machine upon contact with the screed rail, and thus serves as a brake and to slow down the advancement of that side of the machine.

The machine may thus be readily operated and controlled by two men working on the end frame means or walking alongside each side of the machine.

The screeding machine of this invention is readily adaptable to slabs of different width by removing the rollers from the end frame means and substituting therefor rollers of shorter for different selected length. The disassembly and assembly of the rollers is conveniently accomplished by merely loosening the bolt assemblies securing the angle brackets to the side members.

In the case of the front and rear rollers, the bolts need not be withdrawn; the nuts need only be loosened so that the bolt may be removed from the open-ended slot of such angle brackets. In the case of the intermediate roller, the bolts are removed from engagement with the closed end slots. After removal, the angle brackets and associated bearing means may be readily disassembled from the ends of each roller and assembled on similar stub shafts of the selected shorter rollers for example. The angle brackets and associated rollers may then be simply assembled on the side members by reversing the operation described above.

The non-rigidity of the machine and the ample tolerance permitted for general coaxial alignment of the stub axles with the rollers provide for the creation of vibrations of relatively small amplitude when the motors 50 and 53 are in roller-driving operation so as to effectively work a freshly poured concrete mix. Increased rotation of the front levelling roller will tend to increase the frequency and amplitude of the vibrations and thereby effectively work concrete mixes of stiffer character.

It will thus be readily apparent that the screeding machine of this invention is not only lightweight, adjustable to work mixes of different characteristics and adaptable to slabs of different widths, but is also self-propelled and may be readily controlled in its advancement as desired. It is also understood that various modifications and changes may be made in the driving means for the rollers, the manner in which the driving means are mounted on the end frame means and the particular structure of the side frame members.

It should be noted that the screeding machine of this invention does not utilize separate rails to guide its movement. Instead the rollers contact the top edge of the screed rails or forms. Such an arrangement facilitates operation of the machine on slopes and banked curves since it can be readily controlled in its movement by manipulation of levers 44 to advance or retard a selected side of the machine.

All such changes and modifications coming within the scope of the appended claims are embraced therein.

I claim:

1. A lightweight, adjustable, self-propelled machine for striking off and leveling freshly poured concrete panels defined between parallel screed rails, comprising: a pair of parallel, longitudinally extending side members in spaced relation, each of said side members including a top flange and a downwardly extending web; roller means including a front leveling roller, a rear driving roller and an intermediate roller adjacent to the front roller; means supporting said roller means from said side members with the lower faces of the roller means below the side members; said support means for the intermediate roller including angle brackets having slot means therein and bolt means extending through the webs of the side members and the slot means for limited vertical movement of the angle brackets and the intermediate roller; lever means pivotally carried by each side member for pressure contact with the associated angle bracket in the position to move and to hold the intermediate roller in lowermost position for raising the front leveling roller slightly above the plane of the screed rails; each lever means being in non-pressure contact with the angle brackets for the intermediate
roller in another position to lower the front roller into contact with screed rails for moving the machine backwards; means mounted intermediate the ends of one side member and operably connected to the rear roller for driving said roller to advance the machine; means intermediate the ends of the other side member and operably connected to the front leveling roller for driving said front roller in a direction opposite to the rear roller and at a speed different than the speed of the rear roller; and means carried by each side member for holding each lever means in pressure contact with the angle bracket associated with the intermediate roller.

2. A lightweight, adjustable, self-propelled machine for striking off and leveling freshly poured concrete slabs defined between parallel screed rails, comprising: a pair of parallel, longitudinally extending side members in spaced relation, each of said side members including a top flange and a downwardly extending web; roller means including a front extending roller, a rear driving roller and an intermediate roller adjacent to the front roller; means supporting said roller means from said side members with the lower faces of the roller means below the side members; said support means for the intermediate roller including angle brackets having slot means therein and bolt means extending through the webs of the side members and the slot means for limited vertical movement of the angle brackets and the intermediate roller; lever means pivotally carried by each side member for pressure contact with the associated angle bracket in one position to move and to hold the intermediate roller in lowermost position for raising the front leveling roller slightly above the plane of the screed rails; each lever means being in non-pressure contact with the angle brackets for the intermediate roller in another position to lower the front roller into contact with screed rails for moving the machine backwards; means mounted intermediate the ends of one side member and operably connected to the rear roller for driving said roller to advance the machine; means intermediate the ends of the other side member and operably connected to the front leveling roller for driving said front roller in a direction opposite to the rear roller and at a speed different than the speed of the rear roller; each lever means being independently operable for controllably releasing the associated angle bracket for the intermediate roller to lower one side of the front leveling roller to retard advancement of the said one side.

3. In a screeding machine adapted to level freshly poured concrete slabs defined by longitudinally extending screed rails, the combination of: longitudinally extending parallel end frame means; a plurality of rollers including a rear forwardly driven roller, a front rearwardly driven leveling roller, and an intermediate roller; bracket means carried by the end frame means and providing journal mountings for said rollers; the bracket means for the front and rear rollers being in normally fixed relation to the end frame means; the bracket means for the intermediate roller being vertically reciprocally movably with respect to the end frame means for selectively vertically positioning the intermediate roller with respect to the end frame means for lowering the front roller into contact with the screed rails in one position and for lifting the front roller above said rails in another position; lever means pivotally carried by each end frame means for selectively positioning the bracket means for the intermediate roller; said lever means being independently operable to lower one side of the front roller into engagement with the adjacent screed rail for retarding advancement of the same side of the machine; and means carried by the end frame means for selectively driving the rear roller to advance the machine forwardly and for selectively driving the front roller in an opposite direction for moving the machine rearwardly.

4. In a machine as claimed in claim 3 wherein holding means are carried by the end frame means for engaging with the lever means for maintaining the intermediate roller in the said another position.

5. In a screeding machine for leveling freshly poured concrete slabs defined by spaced apart longitudinally extending parallel end frame means; a plurality of transversely arranged rollers, said rollers including a forwardly driven roller, a rearwardly driven leveling roller, and a third roller between said forwardly and rearwardly driven rollers; means carried by the end frame means for mounting said rollers thereon, the mounting means for the forwardly driven roller and rearwardly driven leveling roller being in normally fixed relation to the end frame means; the mounting means for the third roller being adjustable with respect to the frame means for selectively positioning the third roller for lowering the leveling roller into contact with the screed rails in one position and for lifting the leveling roller above said rails in another position; means carried by each end frame means for selectively positioning the mounting means for the third roller for lowering both ends of the third roller and being independently operable to selectively lower either end of the leveling roller into engagement with the adjacent screed rail for retarding advancement of that side of the machine; and means carried by the end frame means for driving the driven roller to advance the machine forwardly and for driving the leveling roller in an opposite direction for moving the machine rearwardly.

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