July 17, 1956 A. BEYER 2,754,732

CONCRETE MATTRESS LEVELING AND FINISHING MACHINE HAVING RECIPROCATING SCREEDS

Filed Feb. 27, 1952 3 Sheets-Sheet 1

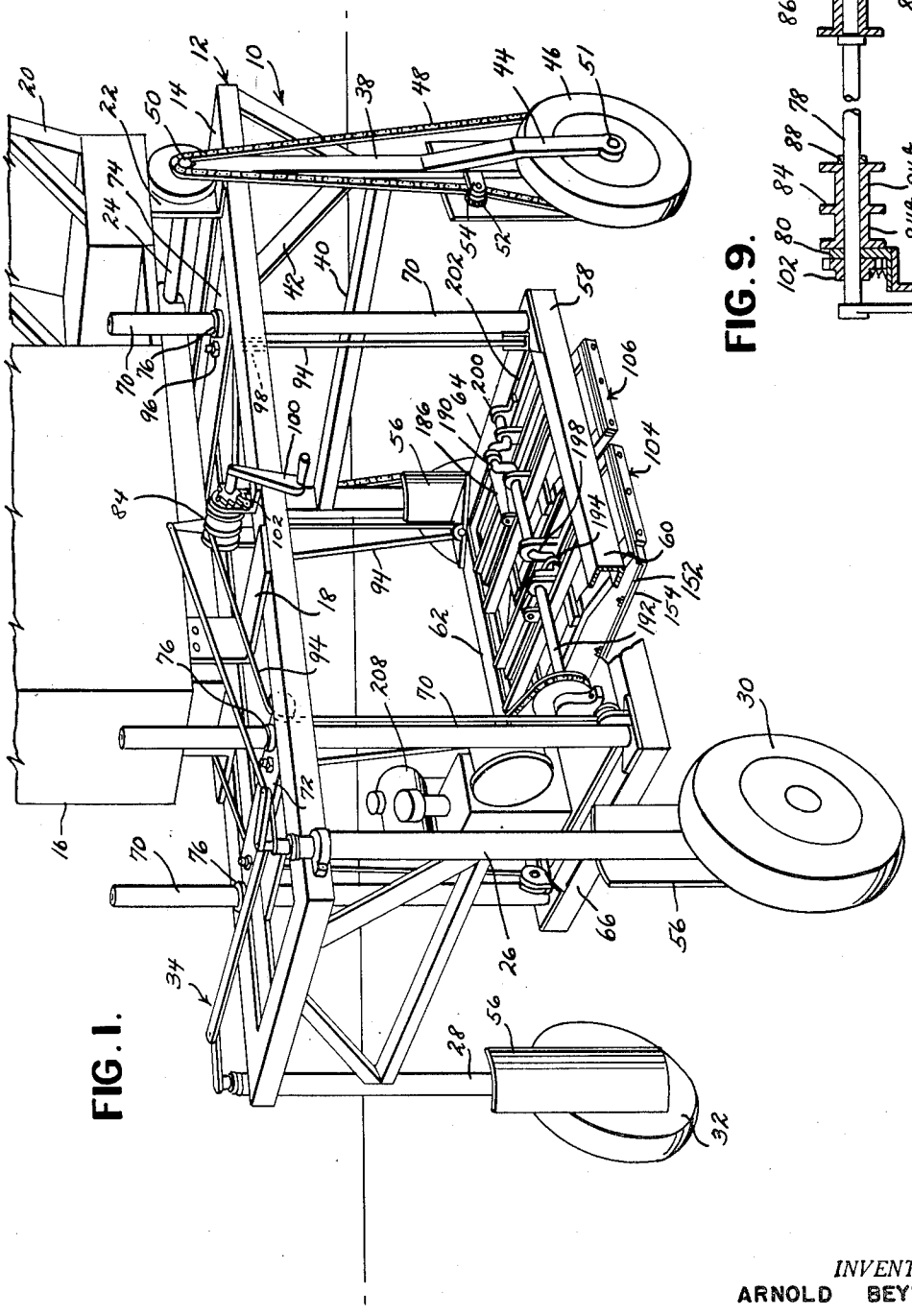


FIG. 1.

FIG. 9.

INVENTOR.
ARNOLD BEYER

BY
Wilkinson & Mawhinney
ATT'YS

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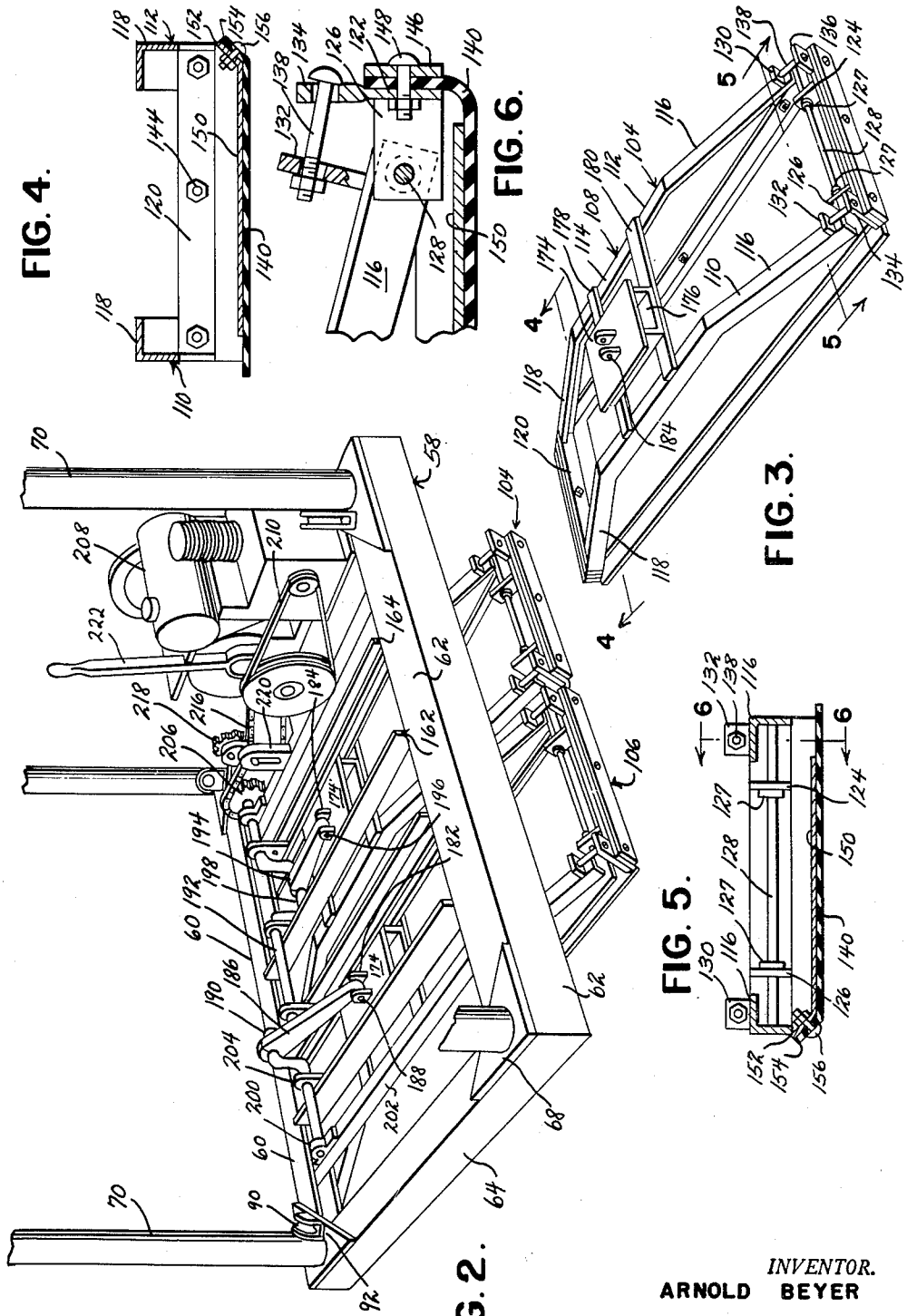


FIG. 2.

FIG. 4.

FIG. 6.

FIG. 3.

FIG. 5.

INVENTOR.
ARNOLD BEYER

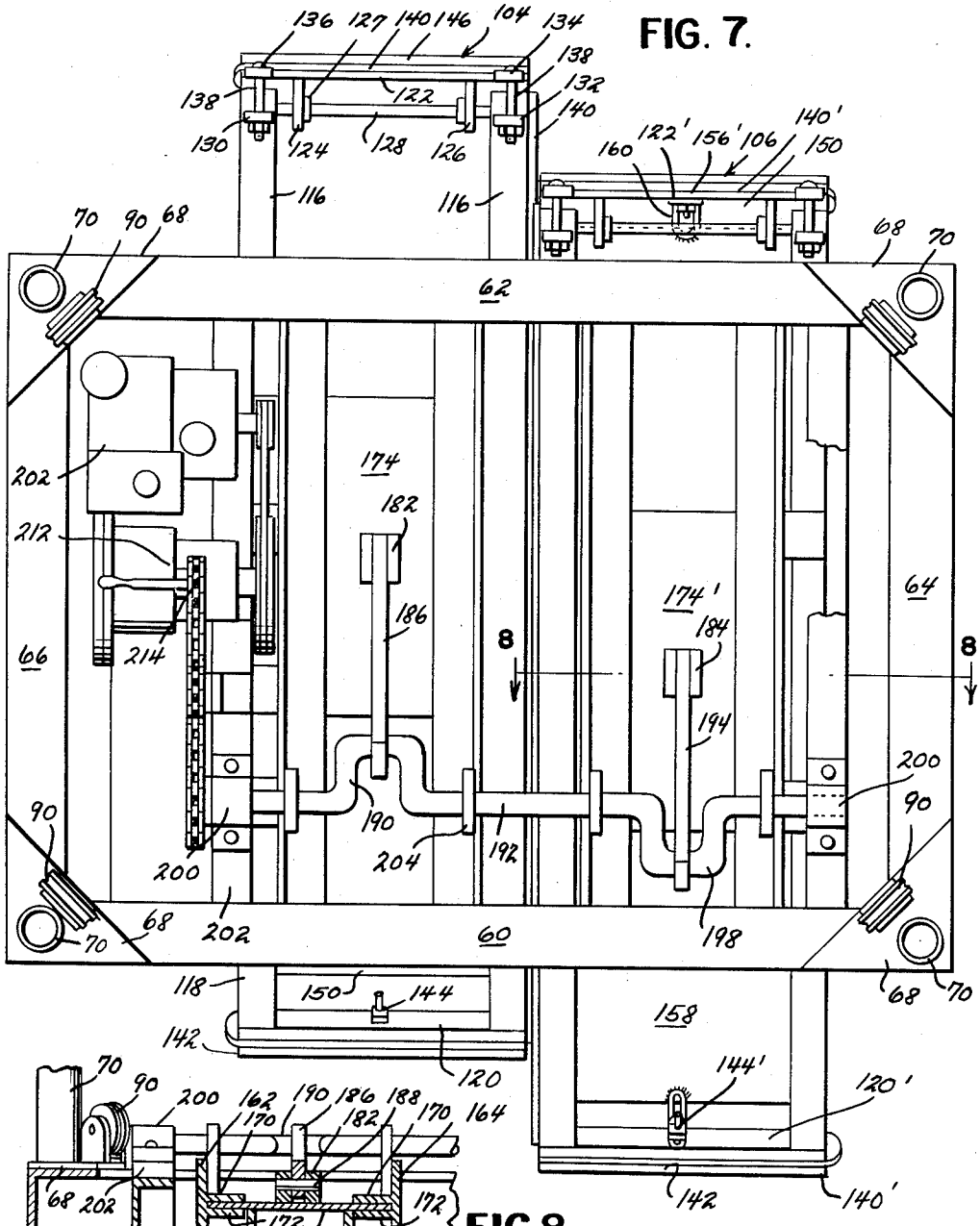
BY
Wilkinson & Mawhinney
ATTY'S

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FIG. 7.



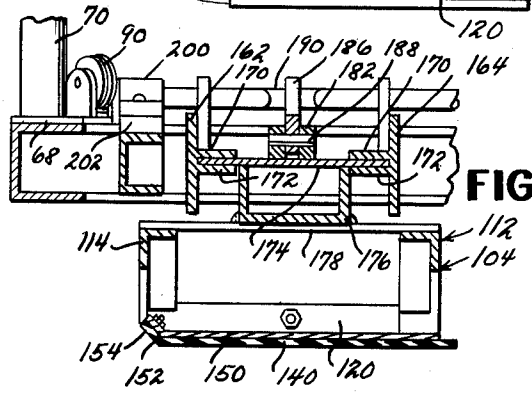


FIG. 8.

INVENTOR.
ARNOLD BEYER

BY Wilkinson & Mawhinney

ATTY'S

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2,754,732

CONCRETE MATTRESS LEVELING AND FINISHING MACHINE HAVING RECIPROCATING SCREEDS

Arnold Beyer, Memphis, Tenn., assignor to Weymouth Construction Company, Memphis, Tenn., a corporation of Wisconsin

Application February 27, 1952, Serial No. 273,591

4 Claims. (Cl. 94—45)

This invention appertains to improvements in machines for leveling and finishing large concrete areas, such as floors, platforms and roadways and more particularly to an improved concrete finishing machine, designed for use in connection with the construction of articulated concrete mattresses.

Such concrete mattresses are constructed in accordance with United States Army specifications and are approximately four feet wide, twenty-five feet long and three inches in thickness. The method of construction consists of casting approximately five hundred to seven hundred squares of mattress on the ground and then casting additional mattresses, one on top of each other, each layer of mattress being separated by two thicknesses of kraft paper until the mattresses are cast in stacks twelve high or over thirty-six inches in overall height.

The primary object of this invention is to level and finish the top surface of the concrete mattress and, therefore, one of the important features of the invention resides in the provision of a screed, which is adjustable from a height of approximately three inches to thirty-six inches from the ground.

Another object of this invention is to provide a pair of side by side, rectilinearly out-of-phase reciprocating screeds, which are mounted on a vertically adjustable frame that is supported by a mobile carriage designed to straddle the mattresses and move longitudinally thereof so as to carry the screeds longitudinally over the mattresses as they reciprocate transverse to the path of movement of the carriage.

A further object of this invention is to provide a screed having a resilient belting and wherein the pressure exerted against the plastic concrete is transmitted by the tautness of the resilient belting, which directly engages the surface of the mattress and produces a dense concrete with a uniform finish. The belting is supported in a taut condition by an open arched frame that is reciprocated over the surface of the mattress.

A still further object of this invention is to provide a pair of cooperating screeds, which are supported by a vertically adjustable frame in side by side relation and which are reciprocated in out-of-phase relation and in parallel rectilinear paths of movement by a prime mover, mounted on the supporting frame.

These and ancillary objects and structural features of merit are attained by this invention, the preferred embodiment of which is set forth in the following description and illustrated in the accompanying drawings, wherein:

Fig. 1 is a perspective view of the concrete surface finishing and leveling machine;

Fig. 2 is a view in perspective of the vertically adjustable supporting frame and companion screeds;

Fig. 3 is a view in perspective of one of the screeds;

Fig. 4 is a transverse sectional view taken on line 4—4 of Fig. 3;

Fig. 5 is a transverse sectional view taken on line 5—5 of Fig. 3;

Fig. 6 is an enlarged detailed sectional view taken on line 6—6 of Fig. 5;

Fig. 7 is a top plan view of the supporting frame and screeds;

Fig. 8 is a fragmentary sectional view taken on line 8—8 of Fig. 7, and,

Fig. 9 is a view, partially in section, of the shaft and drums for vertically adjusting the supporting frame.

Referring now more particularly to the accompanying drawings and initially to Fig. 1 thereof, the concrete mattress finisher 10 includes a mobile carriage 12, which has an open rectilinear main frame 14 on which a conventional internal combustion engine (not shown) is mounted. The engine is conventionally supported within a housing 16, which is mounted by brackets 18 on the frame. An operator's seat 20 is mounted by means of brackets 22 on the frame rearwardly of the engine housing and an axle 24 is rotatably supported by the vertical sections of the brackets, so that the ends extend outwardly of and above the opposing sides of the frame 14. The axle is rotated by the engine through a conventional transmission and differential.

Tubular legs 26 and 28 are secured at their upper ends to the opposing sides of the frame 14 adjacent the front end thereof and carry steerable, ground engaging wheels 30 and 32 at their lower ends. The wheels 30 and 32 are equipped with standard pneumatic tires and the steering is accomplished by a standard type steering gear 34.

Standards 38 are mounted at their upper ends to the sides of the frame 14 adjacent the rear end thereof and are rigidified by a transverse brace 40 and by bracing 42. The lower bifurcated ends 44 of the standards rotatably support ground engaging wheels 46, which are driven from the axle 24 by a chain drive 48. The chain 48 is entrained over a sprocket 50 fixed on the extending ends of the axle 24 and over a sprocket (not shown) which is fixedly circumposed on the wheel axles 51. A chain tightening sprocket 52 is carried by an arm 54 that extends forwardly from the inner branch of the lower bifurcated ends of the standards, the forward reach of the chain being entrained under and held tight by the idler sprocket 52.

The frame 14 is of a width slightly larger than the width of the concrete mattress, that is, a width slightly in excess of four feet, so that rear standards 38 and the front tubular legs 26 and 28 straddle the mattress with the frame horizontally overlying and overlapping the mattress. The carriage is propelled by the driven wheels 46 longitudinally over the mattresses.

To effectively position the carriage and avoid damage to the sides of the mattress, which is in a slightly plastic state, guide means or guards are provided and preferably include plates 56, which are elongated and transversely curved. The plates are affixed at their concave faces to the inner surfaces of the tubular legs and standards and are disposed at the lower ends of the legs and standards in a manner to encompass the inner portions thereof. The plates are slightly curved around the legs and standards so as to prevent the legs and standards from contacting the opposing sides of the mattress. The plates have their curved surfaces confronting and engaging the sides of the mattress and the sides will, therefore, not be subjected to any piercing or gouging force. Additionally, the plates will act as guides for the carriage.

A vertically adjustable supporting frame 58 is carried by the carriage 12 and suspended from the frame 14, inwardly of the ends and sides thereof. The frame 58 is of rectangular shape and includes opposing channel shaped sides 60 and 62, having their open sides in confronting relation. The side channels are welded or otherwise secured at their ends to end channels 64 and 66. The

corners of the frame are rigidified by triangular plates **68**, which are welded or otherwise fixedly superimposed on the top of the frame at the corners.

Tubular standards or pipes **70** are affixed at their lower ends to the plates **68** and, thus, project upwardly from the four corners of the supporting frame **58** for engagement with the cross bars **72** and **74**, which extend between the sides of the frame **14**. The cross bars **72** and **74** are formed with vertical openings adjacent the sides of the frame **14**. Collars or rings **76** are fitted in the openings to reinforce the walls thereof and the collars slidably receive the tubular standards or pipes **70**.

Means is provided for raising and lowering the frame **58** by sliding the tubular standards upwardly and downwardly through the collars **76** in the cross bars. The means, shown in Figs. 1 and 9, is manually operated but power means may be provided for effecting the vertical adjustment of the frame **58**. The means includes a shaft **78**, which is rotatably supported by brackets **80** and **82**, that are mounted on the opposing sides of the frame **14**, so that the shaft underlies the housing **16**. Double drums **84** and **86** are fixedly circumposed on the shaft and located on the ends thereof against movement axially of the shaft by stop collars **88**.

On each of the plates **68**, a sheave or pulley **90** is mounted, with the web **92** of the supporting bracket for the sheave being welded on the plates inwardly of the tubular standards **70**. Cables **94** are fixed at one of their ends by nuts **96** to the cross bars, inwardly of the collars **76**, and are entrained around the pulley **90** and around guide pulleys **98** carried by the sides of the frame **14**. The opposing ends of the cables are suitably fixed to the drums.

As seen in Fig. 1, the cable **94** for the left rear end of the frame **58** extends under the drum **84***a*, while the cable **94'** for frame **58** extends over the drum **84***b*. A similar arrangement is provided for the cables **94**, that support the other corners of the frame **58**, so that the shaft **78**, when rotated by the crank handle **100** in a clockwise direction will wind all of the cables on the drums and correspondingly raise or lift the frame **58**. Counterclockwise rotation of the crank handle **100** will, of course, unwind the cables from their respective drums. A spring urged pawl and ratchet **102**, as seen in Fig. 9, is provided to lock the shaft **78** against accidental rotation and prevent accidental unwinding of the cables and consequent dropping of the frame **58**.

Companion screeds **104** and **106**, of identical construction, are carried by the frame **58** in a suspended fashion and are reciprocated in out-of-phase relation and transversely of the path of movement of the carriage, as the carriage is moved over the mattress, to produce a rough texture finish, which is level and entirely free from humps or valleys.

The screed **104**, as seen in Figs. 3–6, includes an arched rectangular frame **108** having opposing sides **110** and **112**. The sides are formed with flat center sections **114**, and declined end sections **116** and **118**. The end sections **118** of each side of the frame are connected by an integral end bar **120**, which is arranged transverse thereto.

The other end of the frame is open and is provided with a cross bar **122**, which has a pair of rearwardly directed and longitudinally spaced arms **124** and **126**. The arms are apertured to receive a rod **128** that extends transversely between the free ends of the declined end sections **116** of each side of the frame. The rod is formed with integral stops **127** that locate the arms thereon.

The declined end sections **116** of each of the sides **110** and **112** of the frame are formed with upstanding apertured ears **130** and **132** that are arranged in confronting relation to upstanding ears **134** and **136** formed vertically on the ends of the end bar **122**. Elongated bolts **138** are disposed through the apertures in the confronting ears **130** and **136** and the ears **132** and **134** to adjustably fix

the end of the frame to the end bar **122**, for a purpose to be described.

An elongated rectangular shaped resilient belting **140** is carried by the ends of the frame and is secured thereto in taut condition. One end of the belting is secured to the end bar **120** of the frame by a clamping plate **142**, which is secured by bolts **144** to the end bar **120**, with the end of the belting clamped between the plate and the end bar. The other end of the belting is secured to the end bar **122** by a similar clamping plate **146** and bolts **148**, that pass through the plate and belting. The bolts **138** are provided to take up any slack in the belting, since as the bolts are drawn up tighter, the end bar **122** can swing upwardly about the rod **128** to thereby tighten the belting **140**.

A flat reinforcing plate **150** is superimposed on the upper surface of the belting **140** and is preferably of sheet metal or the like material. As seen in Fig. 5, the plate **150** is formed on its outer side edge with an angular upstanding flange **152** and the outer side edge **154** of the belting is turned up and secured by bolts **156** to the flange. The bolts **156** constitute the sole fastening means for securing the reinforcing sheet **150** on the resilient belting so that the rest of the sheet merely lies on the belting and serves to weight the belting.

The screed **106** is constructed in a manner similar to the construction of the screed **104**, except that, as seen in Fig. 7, the reinforcing sheet **158** is attached to the end bar **122'** by a chain or similar connecting member **160**, that is secured to the end of the sheet and to the center bolt assembly **156'**. Similarly, the other end of the sheet is secured by a chain to the bolt **144'**. Thus, the sides and ends of the sheet **158** are not attached to the resilient belting but are attached to the ends of the frame, so that the sheet **158** rests on the upper surface of the resilient belting **140'**, without any attachment to the belting.

As seen in Fig. 7, the inner side edge of the belting **140** on the screed **104** is overlapped by the inner side edge of the belting **140'** on the screed **106**, so that the inner side edge of the belting **140'** rides over the adjacent side edge of the belting **140**, as the screeds are reciprocated in opposite directions. The inner side edges of the reinforcing plates or sheets **150** or **158** are spaced from the inner side edges of the respective beltings, so that the inner side edges of the belting are not reinforced and are unattached.

As seen in Figs. 2 and 8, guide means is provided for each of the screeds. The guide means includes a pair of vertically arranged plates **162** and **164**, which are arranged in pairs between the opposing sides **60** and **62** of the frame **58**. As seen in Fig. 8, the inner confronting faces of the plates are formed with vertically spaced bars **170** and **172** that extend laterally from each plate and form tracks within which the opposing side edges of the plate **174** are slidably disposed. The plate **174** is mounted on the ends of the upstanding legs of a channel bar **176**, which is supported by a pair of cross bars **178** and **180**. The cross bars are transversely mounted between the center sections **112** on each side of the screed frames.

Upstanding complementary apertured ears **182** are formed on the upper surface of the plate **174** for the screed **106** and a similar pair of ears **184** are formed on the upper surface of the plate **174'** for the screed **104**. A connecting rod **186** is secured by a wrist pin **188** to the ears **182** and connects the plate **174** to the throw **190** of a crank shaft **192**. A connecting rod **194** is fixed to the ears **184** by pin **196** and connects the plate **174'** to the throw **198** of the crank shaft. The ends of the crank shaft are journaled in the bearing blocks **200**, which are mounted on cross bars **202** that extend between the sides **60** and **62** of the frame **58**. Intermediate the ends thereof, the shaft is supported by bearing brackets **204**, which extend upwardly from the plates **162** and **164**.

A sprocket **206** is fixed on one end of the crank shaft and is connected by a suitable belt and chain transmission to a conventional gasoline engine **208**, which is mounted

on one end of the frame **58**. The chain **206** is driven by the engine through a belt drive **210** and gear reduction unit **212**, which drives a sprocket **214**. The sprockets **206** and **214** are connected by a chain **216**, which is provided with a chain tightening sprocket **218**, that is mounted on a vertically slotted bracket **220**, so that the sprocket **218** can be adjusted vertically with respect to the upper reach of the chain on which it engages.

In operation, the carriage is guided by an operator through the medium of the front steerable wheels **30** and **32** from the seat **20** and is propelled by the engine driven axle **24** and chain drive therefrom to the rear driven wheels **46**. The front tubular legs **26** and **28** and the rear standards **38** are spaced apart to straddle a row of mattress, so that the frame **12** horizontally overlies the mattress.

Conventionally, approximately 500 to 700 squares of mattress are cast on the ground, in rows of various lengths. The carriage straddles the rows and moves longitudinally over the mattress, which are in plastic state.

Each mattress has a width of 4 feet, a length of 25 feet and a depth of 3 inches. The mattresses after curing are subsequently shipped to predetermined destinations for use for example by the Air Force for reinforcement installation of emergency landing strips. The mattresses are placed upon sandy or soft ground and a landing strip or mat is placed thereover.

The gasoline engine **208** is connected to the belt drive **210** by a clutch (not shown) actuated by a clutch handle **222**. Before the operator assumes his position on the seat **20** and operates the carriage in a manner similar to the operation of a tractor or other vehicle, the clutch is engaged through the medium of a handle **222** so that the screed frames are reciprocated by the engine **208**.

It will be noted that the engine **208** is disposed at the front end **66** of the frame **58** so that the front of the carriage is weighted in order to counteract the weight of the engine and operator at the rear of the frame **12**. The frame **58** is adjusted by using the crank **100** and through the medium of the pulleys and cable system, so that the under surfaces of the beltings **140** and **140'** are in direct engagement or contact with the upper surfaces of the freshly poured concrete mattress, as the carriage is driven longitudinally over the mattress. The screeds are reciprocated transversely of the path of movement of the carriage or transversely of the longitudinal axis of the mattress in a sawing action or out-of-phase rectilinear paths of movement. The flange **152** and outer side edge **154** of the belting **140** form the lead edge, as the carriage is driven over the mattress. Thus, as seen in Fig. 1, the lead edge of the first screed **104** is upturned so that it rides over and smooths down the plastic concrete forming the upper surface of the engaged mattress. This prevents any gouging of the surface.

The first screed **104** has its reinforcing plate **150** secured to the lead edge **154** thereof, so that the reinforcing plate weights the lead edge and rests on the belting in a somewhat overall secured manner.

The belting **140** on the lead or first screed **104** is therefore weighted more than the belting **140'** on the trailing or second screed **106**. The reinforcing plate or sheet **158** on the belting **140'** of the trailing screed **106** floats on the belting, since it is not secured to the belting but is secured at its ends to the ends of the frame for the trailing screed **106**.

Thus, the lead screed **104** packs down, due to its weight, the surface of the mattress, as it is moved longitudinally over the surface and reciprocated transversely thereof. The belting **140'** on the trailing screed is held in taut condition and the reinforcing plate floats thereon so that the pressure that the belting **140'** exerts against the fresh concrete is transmitted by the tautness of the rubber belting and not through any direct pressure by the reinforcing plate on any of the parts of the frame which support the belting.

The reciprocating screeds, by the rectilinear or sawing and screeding action, produce final consolidation of the concrete and the final finishing. The end result is a dense concrete, packed by the lead screed **104** and initially smoothed thereby and finally smoothed or leveled by the trailing screed **106**. The finish is a rough texture, rather than a smooth or glassy finish, and is perfect in alignment and entirely free of humps or valleys.

After the first row of mattress has been finished, a double layer of kraft paper is laid on the finished upper surface and an additional mattress is cast on top of the kraft paper. The frame **58** is then raised a distance of approximately three inches, so that the engaging or under surfaces of the belting **140** and **140'** are positioned for direct and proper contact with the plastic upper surface of the freshly poured second layer of concrete mattress.

The operation is continued, with the frame **58** being raised, as additional layers of mattress are cast, until the mattresses are cast in layers or stacks approximately twelve high.

While a specific form of drive means for the carriage and specific type of prime mover and operating means for the screed frames has been shown in the disclosed and preferred embodiment, it is understood that changes can be made in these details, as well as in other parts of the disclosed embodiment, so that limitation is sought only in accordance with the appended claims.

Having thus described this invention, what is claimed is:

1. A machine for the finishing of concrete mattresses laid in successive vertical tiers comprising a rectangular mobile frame, vertical legs supporting the four corners of the mobile frame, wheels supporting said legs, means for driving at least two of said wheels for propelling said mobile frame at a uniform rate of speed over the tiers of mattresses, a support sub-frame adjustably supported below said mobile frame, a pair of transverse screed members carried by said support frame, means for reciprocating said screed members in opposed directions, means to elevate said sub-frame for vertical adjustment whereby the screeds can be reciprocated at seelcted levels whereby successive vertical tiers of mattresses can be finished as the machine is passed longitudinally thereover.

2. A machine for successively finishing concrete mattresses individually as the mattresses are laid in vertical stacks as claimed in claim 1 wherein said elevating means for said support means comprises hoist means carried by said mobile frame one element of which is connected to said support means for raising and lowering said support means within said mobile frame.

3. A machine for successively finishing concrete mattresses individually as the mattresses are laid in vertical stacks as claimed in claim 2 further comprising guide means one end of which is carried by said support means and the other end of which passes through a portion of said mobile frame for guiding said support and its reciiprocating screeds for varying positions of said screeds as the stack of mattresses becomes successively higher.

4. A machine for successively finishing concrete mattresses individually as the mattresses are laid in vertical stacks as claimed in claim 1 wherein said support means comprises a vertically movable platform supporting thereon drive means for reciprocating said screeds carried by said platform.

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