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Bunger

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[54] **PORTABLE SLATTED ANIMAL PEN FLOOR FORMING APPARATUS**

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[52] **U.S. Cl.** **249/18,** 249/64, 249/176, 249/177, 425/62

[51] **Int. Cl.** **E04g 11/00**

[58] **Field of Search** 249/10, 18, 27, 63, 64, 249/176, 177; 425/62, 453, 454

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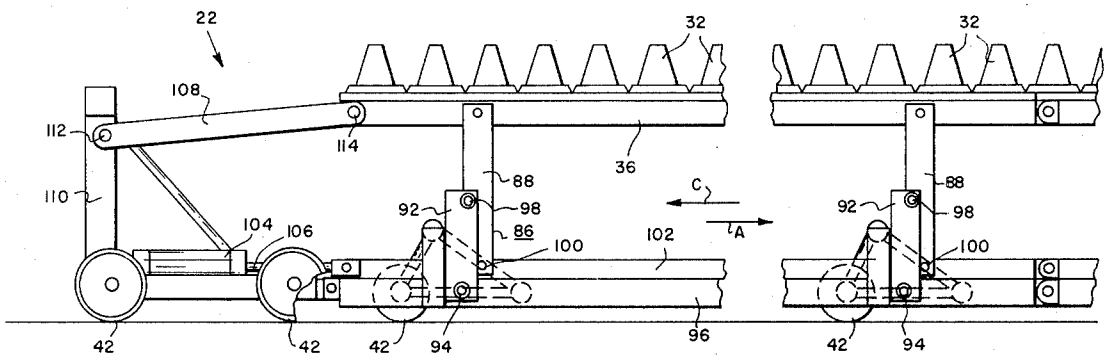
Attorney, Agent, or Firm—Warren F. B. Lindsley

[57] **ABSTRACT**

A portable form for casting in place suspended slatted monolithic-type floor panels or sections of uniform size for animal pens. This same inventive concept may be used to precast monolithic slatted floor panels at a spot near or at the erection site.

8 Claims, 8 Drawing Figures



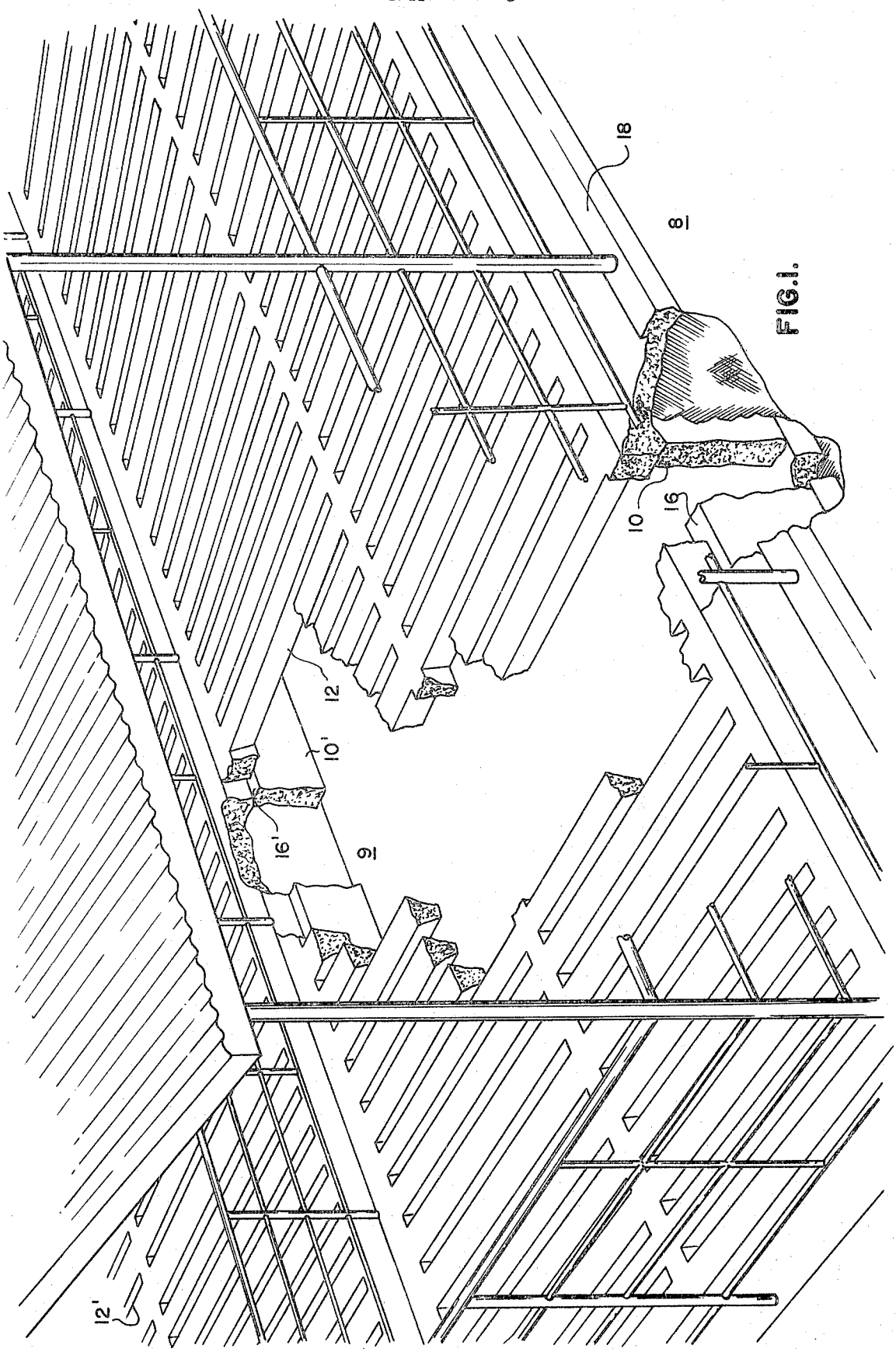


FIG. 1.

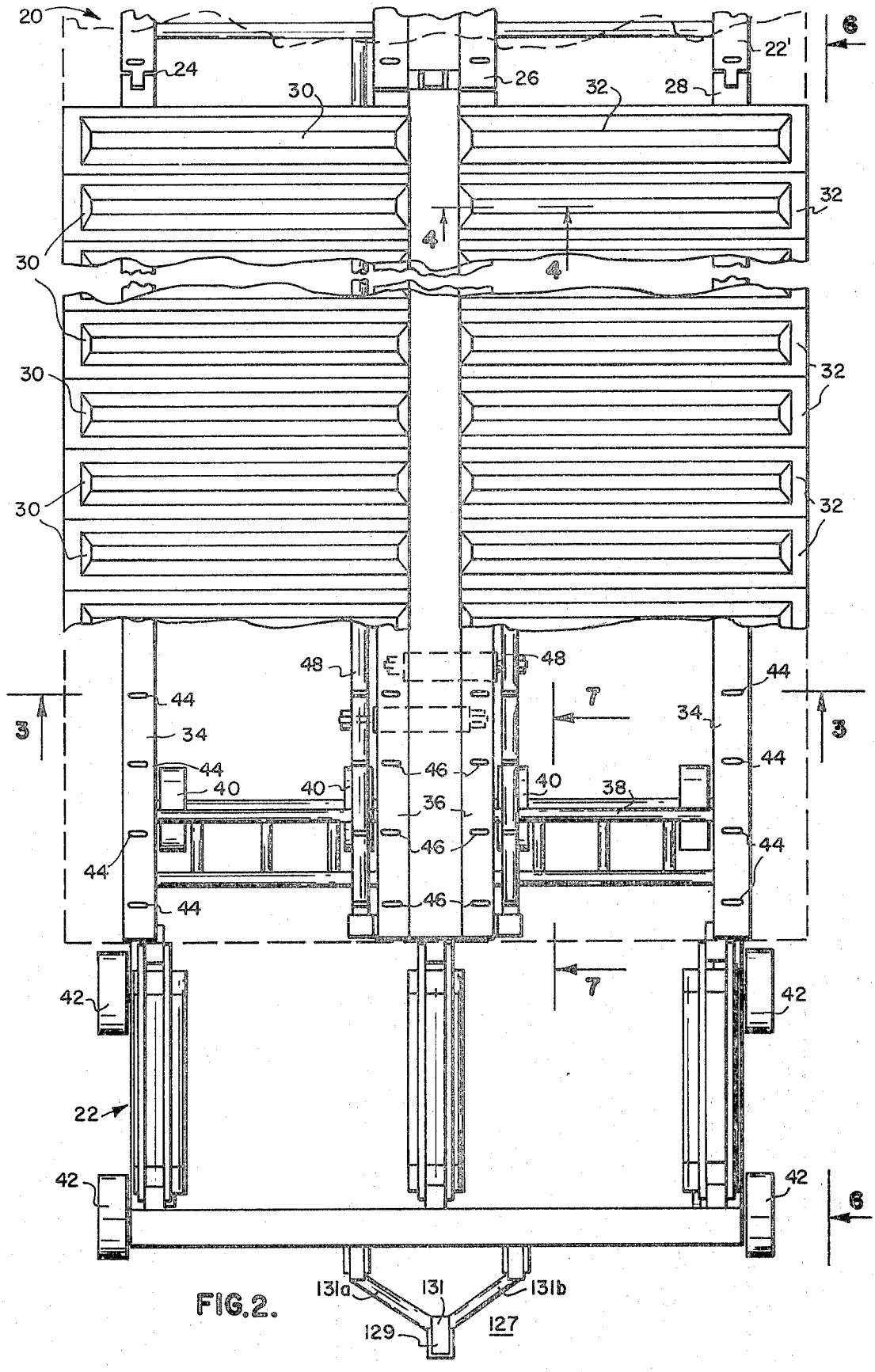

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FIG. 2.

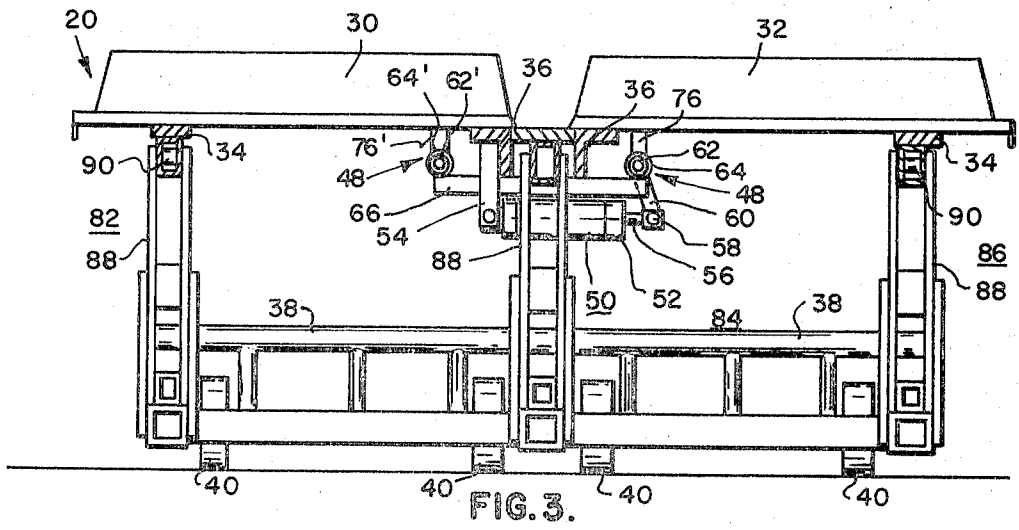


FIG. 3.

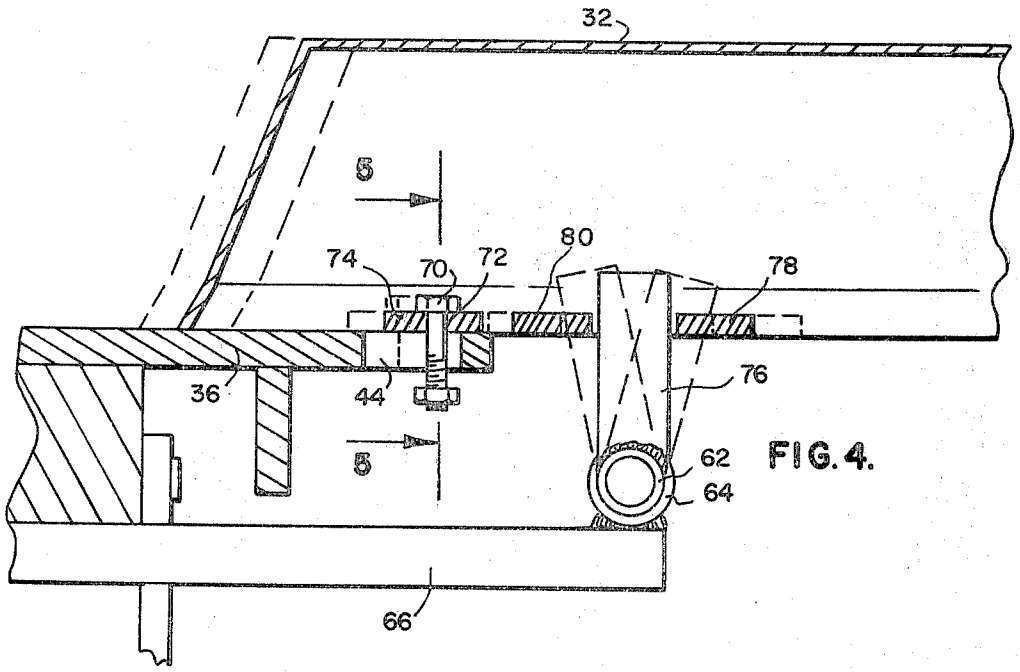
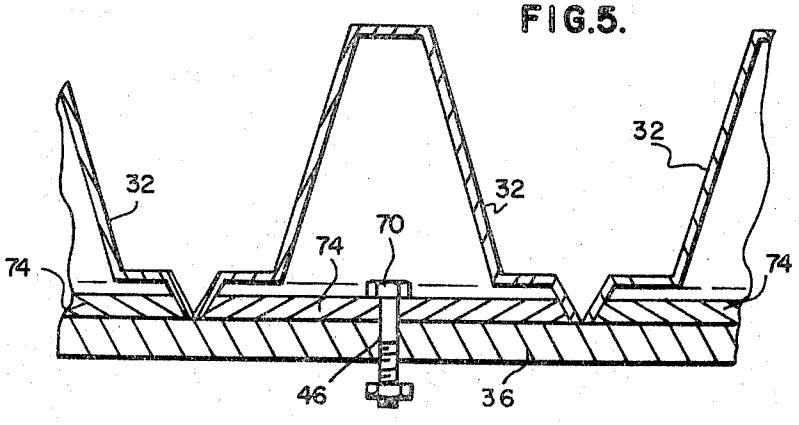


FIG. 4.

FIG. 5.



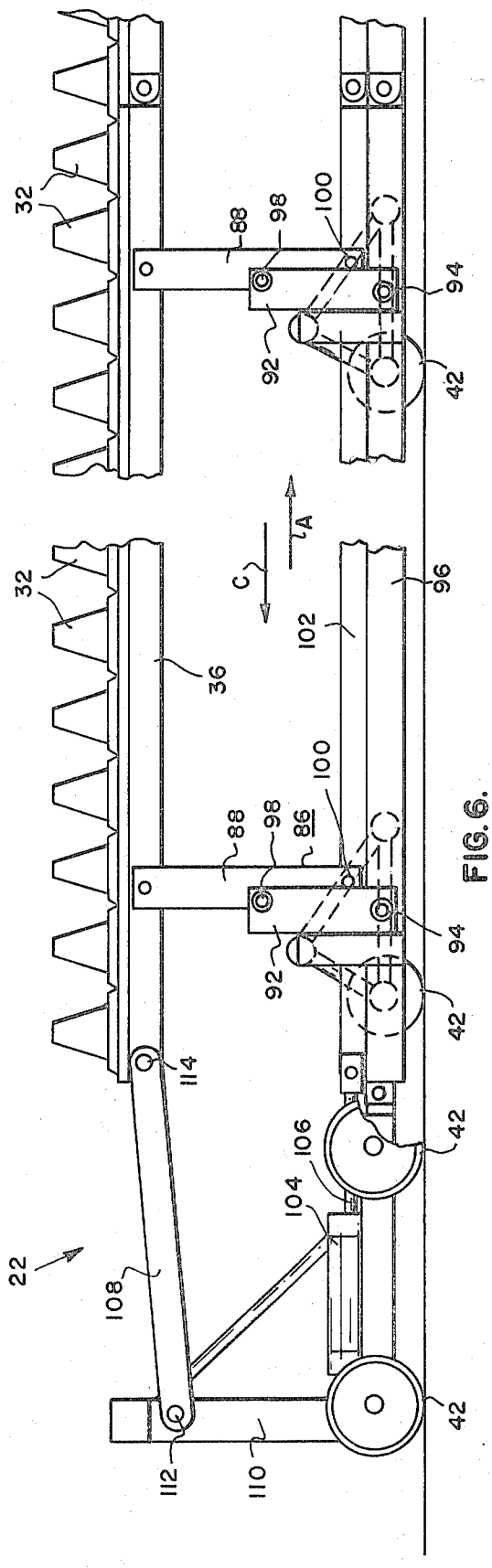

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FIG. 6.

FIG.8.

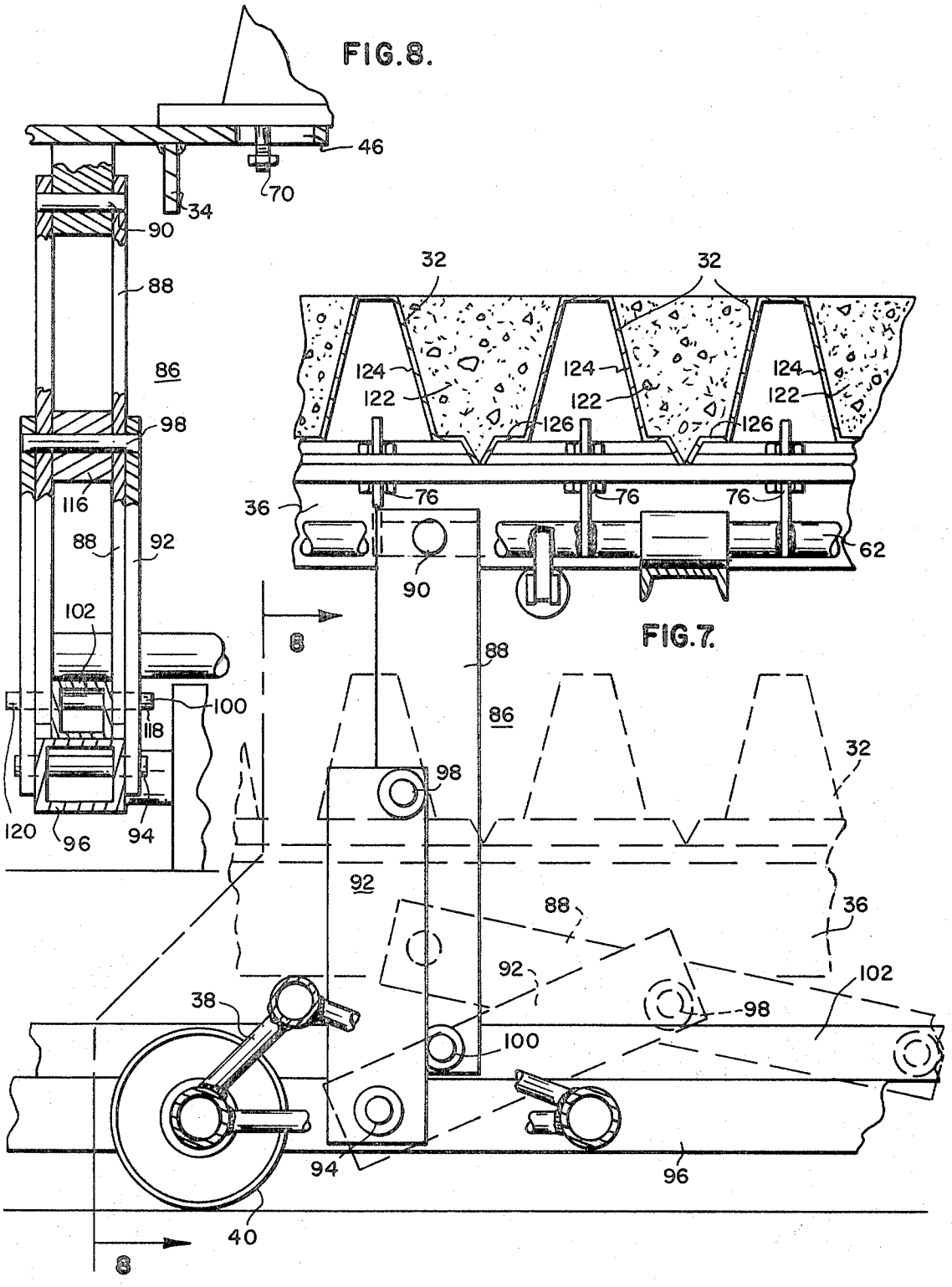
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FIG.7.

PORTABLE SLATTED ANIMAL PEN FLOOR FORMING APPARATUS

BACKGROUND OF THE INVENTION

This invention relates to a method and apparatus for casting in place across supporting walls a plurality of spaced slats, and more particularly to a portable form for casting monolithic-type suspended or elevated grate or slatted flooring for animal pens.

FIELD OF THE INVENTION

This invention is particularly directed to forming in place or at a point remote therefrom a plurality of slats or grates or elevating walls to form a monolithic-type grate flooring used in animal pens where waste removal is a problem. Further, the present invention may also be directed to sewer grate panels and any other floor paneling where drainage or ventilation is a necessity.

DESCRIPTION OF THE PRIOR ART

Heretofore, slat or grate-type flooring panels have been cast in a permanent mold and then dried and cured prior to transportation to a job site for installation. Such a system is costly and inefficient when constructing cattle or swine feeding pens at a distance from the casting site. Further, the transportation of said flooring panels without breakage is difficult due to their inherent size and weight.

SUMMARY OF THE INVENTION

In accordance with the invention claimed, a new and improved method and portable apparatus is provided for casting in place a plurality of interconnected, suspended slats or grates of animal pens of a monolithic type which eliminate the need for hand labor in repeatedly laying the floor panels.

Accordingly, an object of this invention is to provide a portable, reusable form for casting in place or at a point remote from the building site monolithic-type slatted, spaced floor panels.

Another object of this invention is to provide an improved method of casting in place monolithic-type slat or grate floor panels.

A further object of this invention is to provide a self-portable apparatus which may cast in place interconnected slatted floor panels of indeterminate length and width.

A still further object of this invention is to provide a portable form for casting monolithic-type suspended, spaced slat- or grate-type floor panels which may be readily stacked for storage purposes.

A still further object of this invention is to provide a form for casting monolithic-type suspended, spaced slat- or grate-type floor panels which are adaptable to utilize removable slat or grate core forms for varying the size of the slats or grates.

A still further object of this invention is to provide a portable form for casting in place monolithic-type suspended, spaced slat- or grate-type floor panels on the side walls of pits of any suitable depth.

A still further object of this invention is to provide a portable form for casting monolithic-type suspended, spaced slat- or grate-type floor panels of a self-stripping nature.

A still further object of this invention is to provide a portable form producing apparatus for casting in place

suspended floor grating or slats which are arranged to receive reinforcing materials such as steel rebar or a matrix thereof without hampering the stripping operations of the form.

A still further object of this invention is to provide a portable, modular designed form for casting in place suspended, monolithic-type spaced grate or slat floor panels which is easily transportable from job site to job site.

Further objects and advantages of the invention will become apparent as the following description proceeds, and the features of novelty which characterize this invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention may be more readily described by reference to the accompanying drawings, in which:

FIG. **1** is a perspective view of an animal housing pen with portions of the slat flooring broken away for clarity of detail and embodying the invention;

FIG. **2** is a plan view of a portable, self-aligning slat casting form and its associated power section for forming a floor panel section;

FIG. **3** is a lateral cross section of the present invention taken along the line **3—3** of FIG. **2**;

FIG. **4** is an enlarged partial lateral section taken along the line **4—4** of FIG. **2**;

FIG. **5** is a partial longitudinal section taken along the line **5—5** of FIG. **4**;

FIG. **6** is a longitudinal side elevation of the present invention taken along line **6—6** of FIG. **2**;

FIG. **7** is an enlarged partial longitudinal section taken along the line **7—7** of FIG. **2**; and

FIG. **8** is an enlarged vertical section, with portions broken away for clarity, taken along line **8—8** of FIG. **7**.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring more particularly to the drawings by characters of reference, FIG. **1** illustrates a cattle feeding pen **8** and associated waste removal trenches **9** formed according to the disclosed method and apparatus of this invention. A cattle feeding pen of a continuous monolithic-type construction is used to illustrate one configuration, the floor of which may be readily formed by the portable floor forming apparatus disclosed.

As shown in FIG. **1**, the trenches **9** are lined by a pair of spaced-apart, vertically arranged walls **10** and **10'** which support floor panels **12**, **12'** in a grate- or slat-like configuration on their upper surfaces **16**, **16'**. It will be obvious from the example of the relationship of walls **10** and **10'** to panels **12** and **12'** formed of grates or slats that the uniform height, wall thickness and relative placement of walls **10** and **10'** are vital to this particular type of construction and further that the walls **10** and **10'** must run perfectly parallel to one another in order that the grates or slats of floor panels **12** and **12'** will be squarely and adequately supported atop walls **10** and **10'**. Some room for variations in the width of the cores used is provided by the space between the cores.

It is obvious from FIG. **1** that the automatically forming in place of large flooring panels of extreme size and

weight is desirable over transporting said panels or parts thereof to a job site and manually positioning them in place. Further, it will be seen that adjacent floor panels may be integrally arranged and closer tolerance maintained to adjacent sidewalk and gutters **18.** It should be recognized that the panels may be formed adjacent the construction site or at a point remote therefrom, if so desired.

Although a cattle feeding pen has been used to illustrate a type of construction which would most readily benefit from the application of the present invention, it should be understood that the present invention is not limited solely to the production of floor panels for cattle pens and the invention may be used to produce any type of suspended or supported monolithically cast flooring.

Referring to FIG. **2** of the drawings, a portable, monolithic casting form **20** is provided which is actuated and positioned by a hydraulic or pneumatic power actuating means **22** connected to one of its extremities. An identical or similar modular unit **22'** is attached to its opposite extremity at points **24, 26** and **28,** particularly to move the casting forms hereinafter described. Form **20** comprises a plurality of grate or slat casting forms **30** and **32** interconnected with rails **34** and **36** extending longitudinally of the form, as shown.

A wheel carrying frame **38** disposed on wheels **40** is arranged along and underneath rails **34** and **36** forming the main support or frame of form **20.** It should be noted, as shown in FIG. **2,** that the hydraulic or pneumatic power means **22** is also provided with wheels **42** for mobility purposes. Rails **34** and **36** define a plurality of mounting slots **44** and **46** in the support frames **34** and **36,** respectively.

Hydraulic or pneumatically actuated form alignment means **48** are mounted to the bottom side of support rails **36.** These form alignment means **48,** as shown in FIGS. **3** and **6,** each comprise a hydraulic or pneumatically actuated motor **50,** the cylinder **52** of which is fixedly mounted to a downwardly extending frame member **54.** Member **54** is affixed to the underside of support rail **36.** The free end of piston rod **56** of motor **50** is pivotally mounted at point **58** to lever **60.** Lever **60** is fixedly attached to a longitudinally extending actuating rod **62** carried in bearings **64.** Bearings **64** are permanently affixed to a bearing carrying frame **66** affixed to the bottom sides of support rail **36.**

Referring to FIG. **4** of the drawings, it will be noted that forms **32** are each slidably attached to the upper surface of support rail **36** by a suitable fastening means such as a bolt **70.** Bolt **70** passes through a hole **72** in a support strap **74** loosely affixed to the underside of each form **32.** Further, bolt **70** passes through a form mounting slot **44** in support rail **36,** thereby maintaining forms **32** in a close relationship to support rail **36** in a vertical disposition but allowing some vertical displacement, while also allowing lateral movement of forms **32** across support rail **36.**

The form alignment means **48,** through movement of lever **60,** is connected with longitudinally extending actuating rod **62'** housed in bearings **64'.** Bearings **64'** are supported by frame **66** in the same manner as bearings **64.** The longitudinally extending actuating rods **62, 62'** have a plurality of upwardly extending arms **76, 76'** equally spaced along their length to coincide with the longitudinal axes of casting forms **30** and **32** of the portable casting form **20.** Forms **30** and **32** are provided with laterally positioned plates **78** and **80** affixed to their bottom sides, which plates are maintained in close proximity to the upwardly extending lever or actuating arms **76, 76'** of the form alignment means **48.** As seen in broken lines in FIG. **4,** when the piston rod **56** of motor **50** is retracted or extended, the actuating lever **60** attached to longitudinal actuating rods **62, 62'** rotate rods **62, 62',** thereby swinging arms **76, 76'** inwardly and outwardly in a direction laterally of the longitudinal axis of form **20,** moving forms **32** and **30,** respectively, inwardly or outwardly of said longitudinal axis. One form may move ahead of the others until contact with pit walls **10** has occurred.

Referring to FIG. **5,** it will be seen that although the bolt **70** passing through slot **46** of support rail **36** is free to move in a direction laterally of the longitudinal axis of casting form **20,** bolt **70** maintains forms **32** in a close adjacent relationship to one another and prevents longitudinal movement of said forms along support rails **36.** This same bolt connection in slots **44** of rail **34** causes the same type of movement of forms **30,** as evident from the drawings.

Referring again to FIG. **3** of the drawings, it will be seen that portable casting form **20** is provided with identical elevating toggle means **82, 84** and **86** at one or more positions along the length of the casting form which are supported on wheel carrying frames **38.** The wheel carrying frames are supported above ground level by wheels **42.**

Referring to FIGS. **6** and **7** of the drawings, the elevating toggle means **82, 84** and **86** are each provided with an upper leg portion **88** pivoted at its upper end on a pin **90** which extends through support rails **36.** Further elevating toggle means **86** is provided with a lower leg portion **92** which is pivotally mounted by a pin **94** to the lower support structure **96** of the portable form **20.** Still further, leg **88** and leg portion **92** are pivotally connected together with knee action type pin or hinge means **98.** Leg member **88** is additionally provided with a pivot pin **100** which passes through the elevating actuating link **102** of the portable casting form **20.**

As seen in FIG. **6,** the actuating means **22** is provided for elevating and lowering casting form **20** (the lower position being shown in broken lines) and operates as follows: Hydraulic or pneumatic motor **104** has pressure applied to one side of its internal piston (not shown), thereby forcing it and an associated piston rod **106** outwardly, moving an actuating link **102** in the direction of arrow A, carrying with it pivot pins **100** and their associated leg portions **88** of the toggle means **82, 84** and **86.** Leg portion **88** is connected to arm **92** by a pivot pin **98,** arm **92** being pivoted about pin **94** in the support structure **96** When the actuating link **102** moves in the direction of arrow A the support rails **36** are dropped to their dotted line positions shown in FIG. **7.**

To elevate the support rails **36** and their associated forms **30** and **32,** the reverse of the hereinbefore described procedure is affected and the actuating link **102** moves in the direction of arrow C. This action moves pivot pin **100** in the direction of arrow C, bringing the leg **88** and leg portions **92** back to a substantially vertical position with the knee action pivots **98** going substantially over center and locking the elevating toggle linkages **82, 84** and **86,** as more clearly shown in FIG. **7** for toggle linkage **86.**

FIG. 6 illustrates a connecting link **108** of the actuating means **22** connected between an upwardly extending leg **110** of actuating means **22** and support rail **36** by a pair of pivot pins **112** and **114**, respectively. Link **108** acts as a longitudinal retaining means during the raising and lowering of the support rails **34** and **36** and their associated forms **30** and **32**.

Referring to FIG. **8** of the drawings, to further describe the elevating toggle linkage means **82, 84** and **86**, it will be seen that leg **88** and leg portion **92** of toggle means **86** shown thereon are interconnected by hinge pin **98**. Pin **98** passes through a structural block **116** welded or otherwise affixed to the interior of leg **88**, creating an over-center pivot pin **98**. Further, pivot pin **100**, which passes through actuating link **102** and leg portion **92** of elevating means **86**, is provided with extended ends **118** and **120** which act as stops against the lower leg **92** to limit the travel of the elevating means **86** in the direction of arrow C shown in FIG. **6** during elevation, after an over-center condition is reached.

During operation, the portable form **20** is rolled into position on its wheels **40** with its casting table comprised of forms **30** and **32** and support rails **34** and **36** in their lowered position. Motor **104** of actuating means **22** is then retracted, pulling actuating link **102** which in turn moves elevating toggle linkage means **82, 84** and **86** to their vertical positions. This action raises the forms **30** and **32** and rails **34** and **36** into position for the casting of a monolithic grate or slat type flooring.

Once the portable form **20** is in position and the casting table is elevated, minor lateral adjustments of the forms **30** and **32** may be made by actuating the hereinbefore described form alignment means **48**. Deck plates may be placed around the edges of the panel section to be formed by the molds **30** and **32**. When the forms **30** and **32** are in position, the grate or slat flooring is cast in place in cavities **122**, described by the angularly and upwardly extending walls **124** and the outwardly extending base flanges **126** of forms **30** and **32**. Suitable plastic mud such as wet concrete is spread across the top of the platform formed by forms **30** and **32** within the area defined by the deck plates (not shown). Except for these forms, a solid concrete platform would result. When forms **30** and **32** are simultaneously lowered, they result in slats being provided in the concrete slab or panel as shown in FIG. **1**.

The portable form **20** is maintained in position during curing. After curing has occurred, the simultaneous stripping of the forms **30** and **32** is accomplished in the following manner. Motor **104** of actuating means **22** is extended slightly to move toggle means **82, 84** and **86** out of their over-center positions, thereby bringing the entire weight of the portable form **20** to bear in a downward direction. Prior to actuating motor **104**, each form may be tamped to help in dislodging the set concrete therefrom. The form alignment means **48** is then cycled or oscillated, which breaks the bond between the monolithic casting and the forms **30** and **32**. The portable form **20** may then be lowered in a manner hereinbefore described.

Thus, it will be noted that by casting in place a given length of a slatted concrete slab or panel the casting form may be moved along in a trench below the cast-in-place slatted platform and another section integrally formed therewith at either or both ends thereof. By this modular construction a pen of any length or width may be constructed. The novelty disclosed lies in the method and apparatus of forming the slatted platform disclosed.

To facilitate the connecting together of a number of portable casting forms **20**, each apparatus or form is provided with a suitable towing pole **127** fastened to the machine as shown in FIG. **2** which has a tongue **129** pivotally attached at **131** to a pair of arms **131***a* and **131***b*, as shown, for movement vertically to aid in pulling the apparatus upwardly out of a trench. If so desired, the tongue may be of a telescoping nature anchored at various lengths to form a sturdy structure.

It should be recognized that this portable slat or grate-forming machine may be used for forming in place said slats or grates on pit walls of any reasonable height. Further, the disclosed apparatus may be used in forming the slats and grates adjacent the building site or at a point remote therefrom.

Although but one embodiment of the present invention has been illustrated and described, it will be apparent to those skilled in the art that various changes and modifications may be made therein without departing from the spirit of the invention or from the scope of the appended claims.

What is claimed is:

1. A concrete slab-making machine comprising:
- a wheel-mounted main support,
- a frame vertically movable on said main support,
- a releasable locking means on said frame for locking said frame in one position against vertical movement on said main support.
- a plurality of elongated molds, each defining an open cavity facing downwardly on said machine and positioned laterally across the longitudinal axis of said frame.
- said molds being juxtapositioned and defining between adjacent molds, cavities for receiving plastic concrete,
- means mounted on said frame for moving each of said molds laterally of said frame for alignment purposes, and
- power means mounted on said machine for reciprocating said frame relatively vertically to and from said locked position to position said molds for receiving plastic concrete and stripping said molds from the set concrete.

2. The concrete slab-making machine set forth in claim **1** wherein:
- said molds comprise inverted V-shaped channels closed at their ends, which sides rub during movement of said frame, providing an edge cleaning function.

3. The concrete slab-making machine set forth in claim **2** wherein:
- the open ends of said V-shaped channels are provided with flanges which abut adjacent flanges when said frame is in said locked position.

4. The concrete slab-making machine set forth in claim **1** in further combination with:
- stop means on said frame for engaging said molds upon limited lateral movement of each of said molds for alignment purposes.

5. The concrete slab-making machine set forth in claim **1** in further combination with:

a plurality of apertures in said frame, one positioned in the path of lateral movement of each of said molds,

said means for moving each of said molds comprising a stop means for each of said apertures for engaging the periphery of said associated apertures to limit the lateral movement of the associated mold.

6. A concrete slab-making machine comprising:

a wheel-mounted main support,

a frame vertically movable on said main support,

a releasable locking means on said frame for locking said frame in one position against vertical movement on said main support,

a plurality of V-shaped elongated molds each defining a closed-ended cavity facing downwardly on said machine and positioned in two spaced rows substantially parallel with the longitudinal axis of said frame,

each of said molds positioned so that the V-shaped molds extend laterally across the longitudinal axis of said frame,

said molds of each row being juxtapositioned and defining between adjacent molds cavities for receiving plastic concrete,

means mounted on said frame for moving each of said molds laterally of said frame for alignment purposes, and

power means mounted on said machine for reciprocating said frame relatively vertically to and from said locked position to position said molds for receiving plastic concrete and for stripping said molds from the set concrete.

7. The concrete slab-making machine set forth in claim **6** in further combination with:

stop means on said frame for individually engaging said molds upon limited lateral movement of each of said molds for alignment purposes.

8. The concrete slab-making machine set forth in claim **6** in further combination with:

a plurality of apertures in said frame, one positioned in the path of lateral movement of each of said molds,

said means for moving each of said molds comprising a stop means for each of said apertures for engaging the periphery of the associated aperture to individually limit the lateral movement of the associated mold.

* * * * *