Dec. 24, 1968 S. O. CLEMENTE 3,417,859

MATERIAL HANDLING APPARATUS

Filed Feb. 28, 1967 3 Sheets-Sheet 1

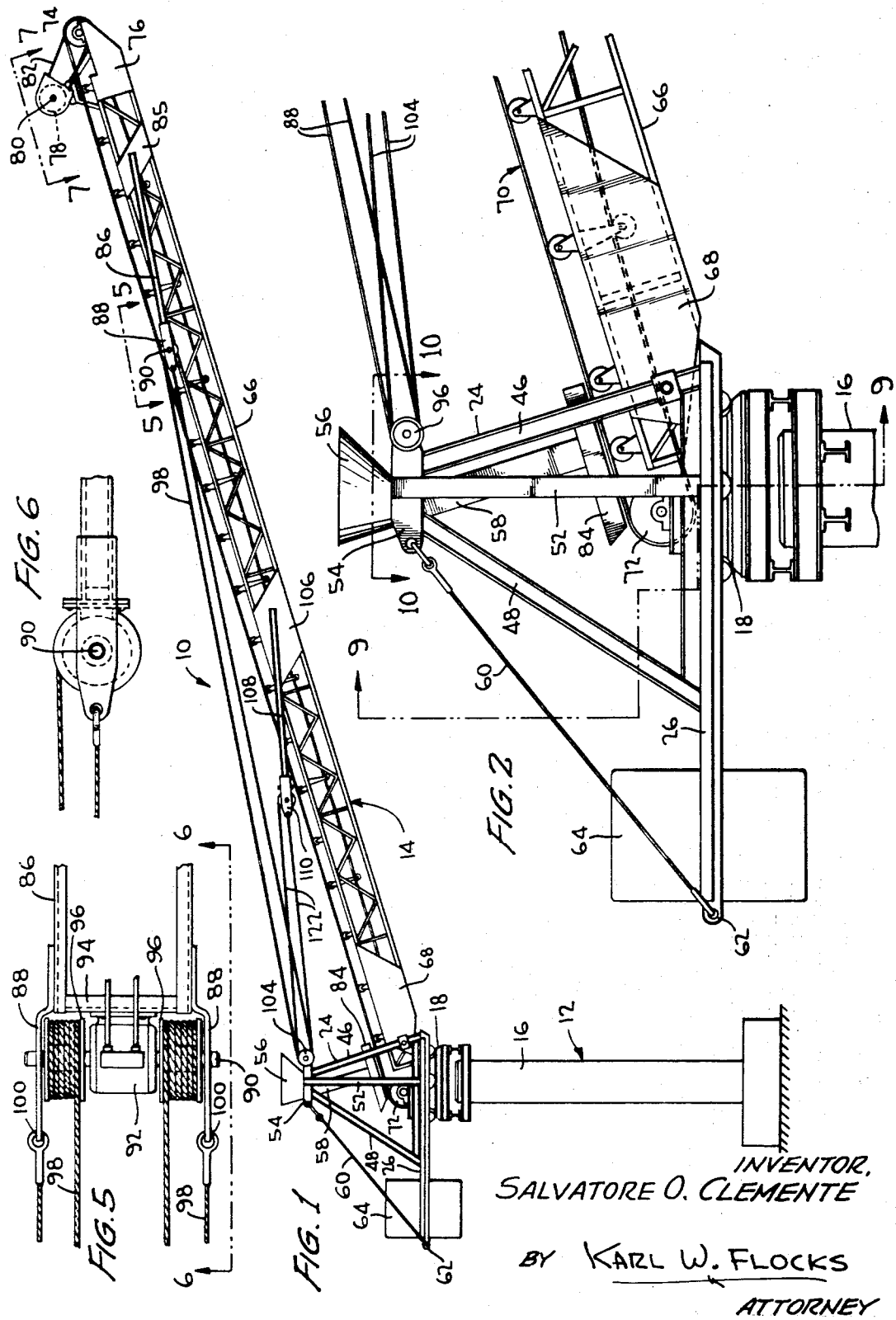

FIG. 1



FIG. 2



FIG. 5



FIG. 6

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Dec. 24, 1968 S. O. CLEMENTE 3,417,859

MATERIAL HANDLING APPARATUS

Filed Feb. 28, 1967 3 Sheets-Sheet 2

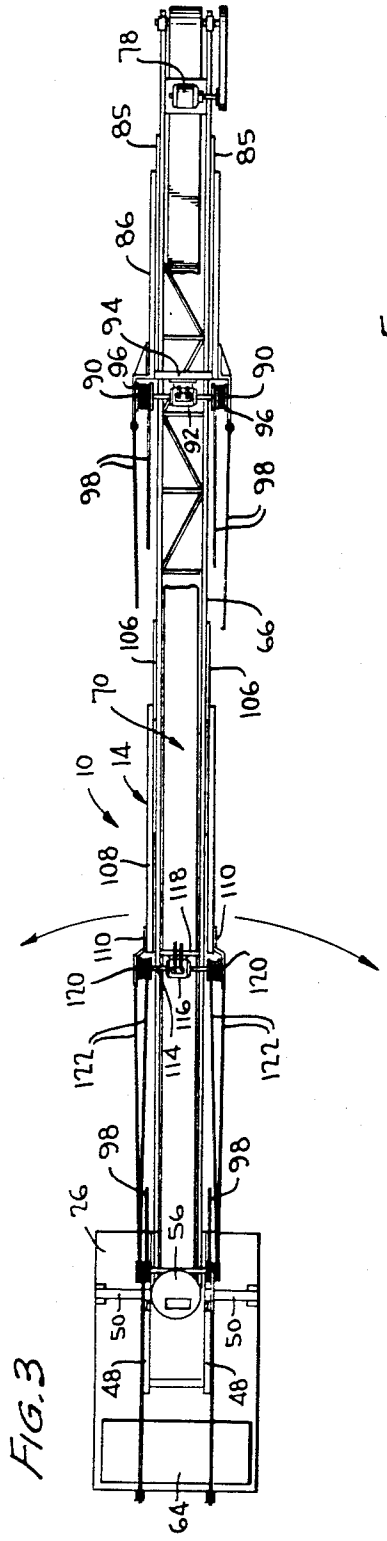


FIG. 3

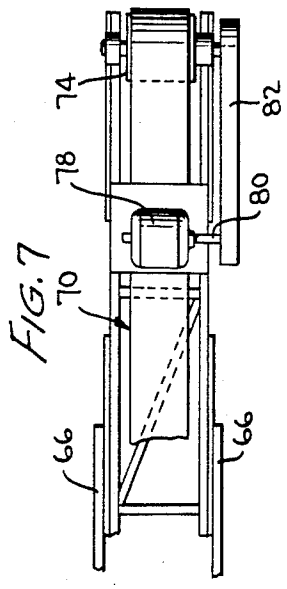


FIG. 7

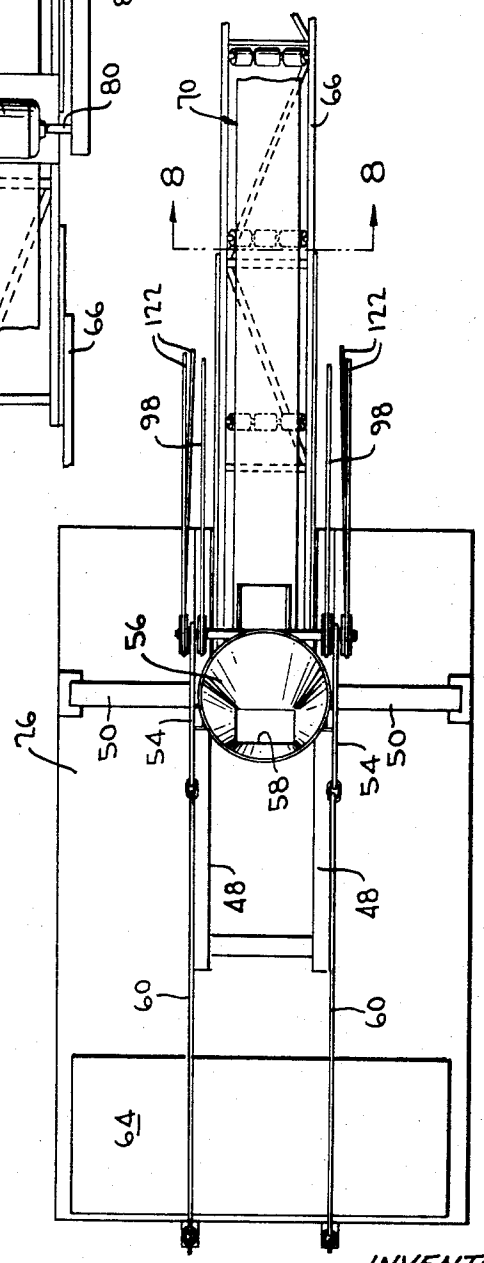


FIG. 4

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Dec. 24, 1968 S. O. CLEMENTE 3,417,859

MATERIAL HANDLING APPARATUS

Filed Feb. 28, 1967 3 Sheets-Sheet 3

FIG. 9

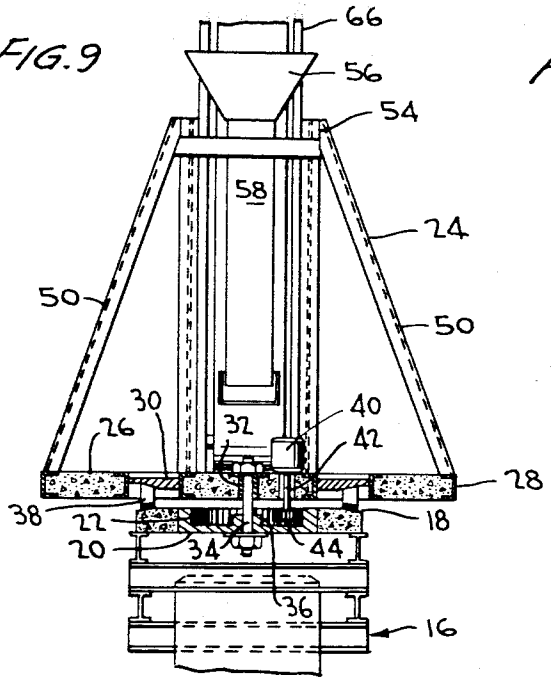



FIG. 8

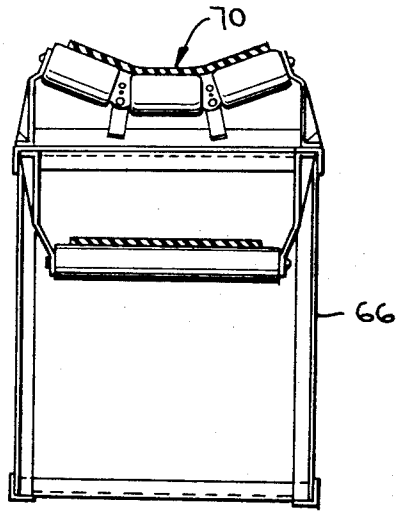
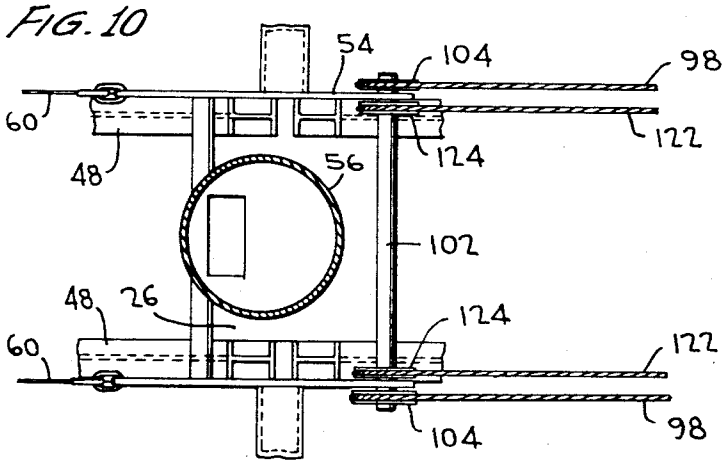



FIG. 10

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3,417,859

# MATERIAL HANDLING APPARATUS

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## ABSTRACT OF THE DISCLOSURE

This disclosure is related to a pivotal, counterbalanced, conveyor-boom which is normally loaded by a compressive force to counteract tensile forces due to weight and loading of the conveyor-boom.

This invention relates generally to material handling apparatus particularly to an improved boom member utilized in a material handling apparatus.

With the extensive use of reinforced concrete structures, the ability to transport concrete to the forms has a direct bearing on the speed at which a building can be erected and a material effect on the cost of the building. Cantilever booms have been used in the past in the erection of buildings; however, the dead weight of such cantilever booms in relation to the maximum load capacity of the booms has resulted in size limitations.

Primary objects of the present invention are to provide an internally loaded boom which increases the boom member load capacity; to provide a novel boom member in which means are provided to apply internal compressive forces counteracting tensile forces applied by the load carried by the boom; to provide means whereby an A-frame is journalled on a vertical axis of rotation and an internally-loadable boom member is counterbalanced for rotation on a vertical axis of rotation; to provide on a novel boom member an endless conveyor and loading hopper and in which the entire structure is rotatable on a vertical axis of rotation.

These together with other objects and the nature and advantages of the invention will become apparent from a consideration of the following description of an exemplary embodiment when taken in conjunction with the drawing forming a part thereof wherein:

FIG. 1 is a side elevational view of a material loading apparatus incorporating the novel boom of the invention;

FIG. 2 is an enlarged fragmentary elevational view showing a portion of FIG. 1;

FIG. 3 is a top plan view of FIG. 2;

FIG. 4 is a top plan view of FIG. 2;

FIG. 5 is an enlarged fragmentary plan view taken substantially on the plane of line 5—5 of FIG. 1;

FIG. 6 is a fragmentary side elevational view looking substantially from the plane of line 6—6 of FIG. 5;

FIG. 7 is an enlarged fragmentary plan view taken substantially on the plane of line 7—7 of FIG. 1;

FIG. 8 is an enlarged vertical section taken substantially on the plane of line 8—8 in FIG. 4;

FIG. 9 is a vertical section taken substantially on the plane of line 9—9 of FIG. 2; and

FIG. 10 is a horizontal section taken substantially on the plane of line 10—10 of FIG. 2;

Referred to the drawing in detail, first considering FIGS. 1–4, indicated generally at 10 is the novel material handling apparatus comprising a support member indicated generally at 12 and a boom assembly indicated generally at 14.

The support member 12 comprises a vertically extending supporting column structure 16 of any suitable character, i.e. reinforced concrete, structural steel, etc. and (not shown) can comprise progressively extendible sections to permit the boom assembly 14 to be progressively raised as the erection of a building proceeds. The member 16 includes an upper bearing face 18 and incorporates a bull gear member 20 having circumferential gear teeth 22.



The boom assembly 14 comprises a vertically extending support frame 24 conveniently described as an A-frame. The support frame 24 includes a support platform 26 of sufficient size to permit an operator to walk thereupon, metal reinforcing or frame members 28, and an inner annular bearing plate 30. Extending axially of the platform 26 is a sleeve 32, and a support shaft or bolt 34 extends through the sleeve 32 and the sleeve portion 36 of the bull gear. Interposed between the annular bearing member 30 and the bearing surface 18 are bearing elements 38. The frame 24 is rotatable about a vertical axis of rotation generally defined by the shaft or bolt 34.

Suitably mounted on the frame 2 is a reversible motor 40 having a depending drive shaft 42 and having a pinion gear 44 fixed to the bottom end and in meshed relationship with the teeth 22 of the bull gear 20. Operation of the motor 40 (in any suitable manner) results in rotation of the frame 24 about the vertical axis of rotation of the frame and this arrangement permits 360° of rotation in either direction.

The frame 24 incorporates pairs of forwardly and rearwardly extending structural members 46 and 48, respectively, as well as side braces 50 and 52. The members 46, 48 and 52 are fixedly secured at the upper ends thereof. and converge at a frame member 54. Suitably secured in the frame 54 is a hopper 56 including a lower discharge chute 58 for depositing material at the inner end of the conveyor-boom to subsequently be described in detail. The frame 54 has extending rearwardly therefrom suspension cables 60 secured at their lower ends to outermost edge 62 of the platform 26 which forms a cantilever beam with respect to the vertical axis of rotation of the frame 24. Suitably secured on the platform 26 is a counterbalance weight 64 which can be of a variable capacity construction (not shown).

The boom assembly 14 includes an elongated conveyor-boom 66 extending in radially opposed relationship with respect to the counterbalance weight 64 and the vertical axis of rotation of the A-frame 24. The inner end 68 of the conveyor-boom 66 is suitably secured on the support frame 24 in any suitable manner. The conveyor-boom 66 incorporates along the length thereof an endless conveyor indicated generally at 70 which may comprise a flexible belt, suitable rollers, and includes inner and outer support rolls 72 and 74, respectively.

Mounted on the outer or terminal end 76 of the conveyor-boom 66 is a drive motor 78; see FIGS. 1 and 7; for example, having a drive shaft 80 having a drive pulley secured thereon and over which is entrained a flexible drive belt 82 engaged over a cooperating pulley on the end of the shaft supporting roll 74. In this manner, the conveyor 70 is power driven for conveying material to the terminal outer end 76 of the conveyor-boom.

The conveyor-boom 66 conveniently includes at the inner end 68 a trough 84 disposed beneath the chute 58 for receiving material therein.

The conveyor boom 66 has secured to opposite sides thereof first gusset or fish plates 85 to which are secured stirrup-like supports 86 straddling the boom and projecting angularly thereabove; see FIGS. 1 and 5, for example.

The stirrup has secured to opposite sides thereof anchor plates 88 in which is journaled a shaft 90. The shaft 90 projects from opposite end of a suitable motor 92 (hydraulic, for example) which is secured to the transverse bight portion 94 of the support 86. The shaft 90 has secured on oppoiste sides thereof drums 96, over which is wound one end of cables 98, the other ends of the cables 98 being anchored at apertured portions 100 of the anchor plates 88.

As most clearly seen in FIG. 10, for example, the frame **54** has suitably supported thereon a transverse support shaft **102**, upon which is journaled sheaves **104**, over which the cables **98** are respectively entrained.

Substantially duplicating the rigging, including elements **85–104**, is a second cable rigging comprising gusset plates **106**, a stirrup **108** and anchor plates **110**. A second motor shaft **114** is journaled in the plates **110** and a motor **116** is secured to the bight portion **118** of the stirrup **108**. The shaft **114** has secured thereto drums **120**, upon which are wound cables **122** which are entrained over sheaves **124** journaled on shaft **102** and the cables are anchored on plates **110**.

Briefly in review, it will be noted that the A-frame **24** is mounted for rotation on a vertical axis of rotation, and through the expedient of the motor **40** can rotate 360° about its axis of rotation. Additionally, the rotation of the conveyor-boom is facilitated by the counterbalancing of the weight thereof through the lever arms of the platform **26** and counterbalance weight **64** in relation to the radially opposed relationship of the conveyor-boom.

The cables **98** and **122**, through motors **92** and **116**, are used to raise and lower the boom member **66** so that the motor **78** can be operated to load or unload the conveyor **70**. Likewise, the boom **66** can be rotated 360° via operation of motor **40**.

The tension imposed on the cables **98** and **122** is used to preload the boom member **66** through the gusset plates **85** and **106**. Still further, the cantilever suspended conveyor-boom is supported by the cables **98** and **122**, and internal compression is applied to the conveyor-boom through the expedient of the fluid motors **92** and **116**, which counteract the tensile forces caused by the weight and loading of the conveyor-boom.

It will be obvious to those skilled in the art that various changes may be made without departing from the scope of the invention and the invention is not to be considered limited to what is shown in the drawings and described in the specification.

What is claimed is:

**1.** In a material handling assembly, a support member and a conveyor boom assembly mounted on said support member, said conveyor-boom assembly comprising an A-frame including a lower platform for permitting a workman to walk thereabout and including means journaling said platform on a vertical axis of rotation on said support member, a contilevered, conveyor-boom member projecting radially from said axis of rotation from one side of said support platform, said support platform including a portion extending in radially opposed relationship to said conveyor-boom member, counterbalance weight means disposed on the terminal end of said platform extension for counterbalancing said conveyor-boom



member, means connected between said support platform and said support member for rotating the A-frame 360° about said vertical axis of rotation, said A-frame including an upper frame member, and means extending between said upper frame member and remote and intermediate longitudinally spaced portions of said conveyor-boom member and normally imposing compressive forces on said conveyor-boom member for counteracting tensile forces caused by the weight and loading of said conveyor-boom member, said last-mentioned means comprising dual cable riggings extending from said upper frame member of said A-frame, said dual cable riggins comprising a transverse support shaft on the upper frame member of said A-frame and including thereon and having journaled thereon pairs of inner and outer sheaves, a first pair of gusset plates secured to opposite sides of said conveyor-boom member, and a second pair of gusset plates secured to opposite sides of said conveyor-boom member and spaced inwardly of the first-mentioned pair of gusset plates and outwardly from said A-frame platform, stirrup-like supports respectively secured at one end to the respective pairs of gusset plates and straddling said conveyor-boom member and projecting angularly thereabove, said stirrup-like supports including a transverse bight portion, motor means mounted on said respective bight portions and including transverse drive shafts, said drive shafts respectively including pairs of cable drums fixedly secured thereto and rotatable with said drive shafts, pairs of cables respectively secured to said drums at one end and windable thereon, said cables being entrained over the sheaves of the upper frame member of said A-frame and terminally anchored at their other ends to opposite sides of said stirrup-like supports.

**2.** The structure as claimed in claim **1** in which the upper frame member of said A-frame includes a downwardly opening feed hopper overlying an inner end portion of said conveyor-boom member, said conveyor-boom member including an endless conveyor extending therealong for receiving material from said feed hopper and depositing the material toward the terminal end of said conveyor-boom member.

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RICHARD E. AEGERTER, *Primary Examiner.*

U.S. Cl. X.R.

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