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[54] **CONCRETE CONVEYOR**
 22 Claims, 15 Drawing Figs.

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 198/204, 198/192, 214/17

[51] Int. Cl. **B65g 57/00,**
 B65g 15/00

[50] Field of Search 198/52, 53,
 185, 192, 208, 88, 92, 89, 204; 280/43.2

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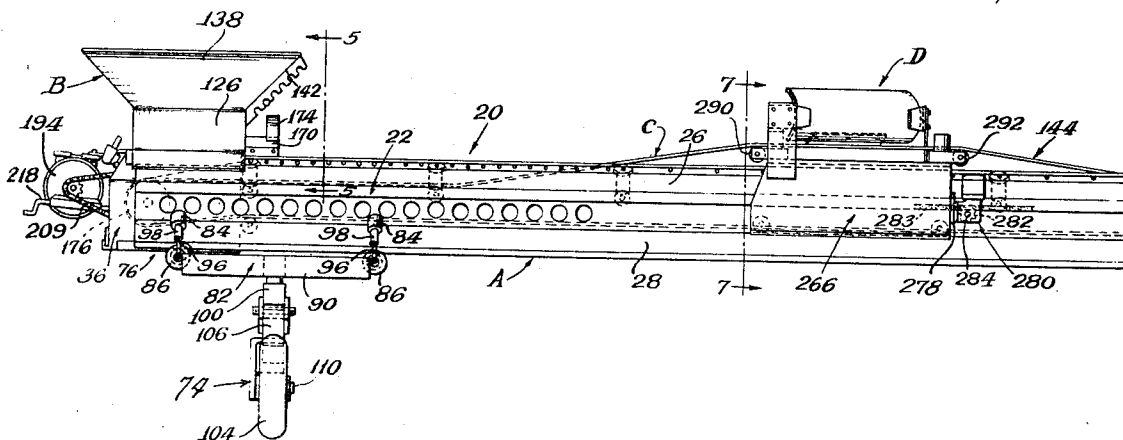
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ABSTRACT: A conveyor mechanism particularly for conveying concrete mix from one place to a place of use. An elongated and movable support frame of unique design is provided and serves several functions, including support of the conveyor mechanism and variable adjustment for the idlers supporting a belt conveyor, and it also includes enclosed chambers for cables, drive chains, and the like. The frame has a hopper at one end for receiving relatively large quantities of concrete. A belt conveyor is movably carried on the frame and moves the concrete from the hopper to the desired place of use. A plow is movably mounted on the frame and the path of travel of the concrete mix carried on the conveyor is intercepted by the plow and is diverted laterally from the longitudinal axis of the conveyor to the place of desired use. The belt conveyor is supported generally in a U-shape, by a unique structure, between the hopper and the plow; at the plow the belt is desirably moved into a flattened condition to provide a proper discharge for the concrete mix.



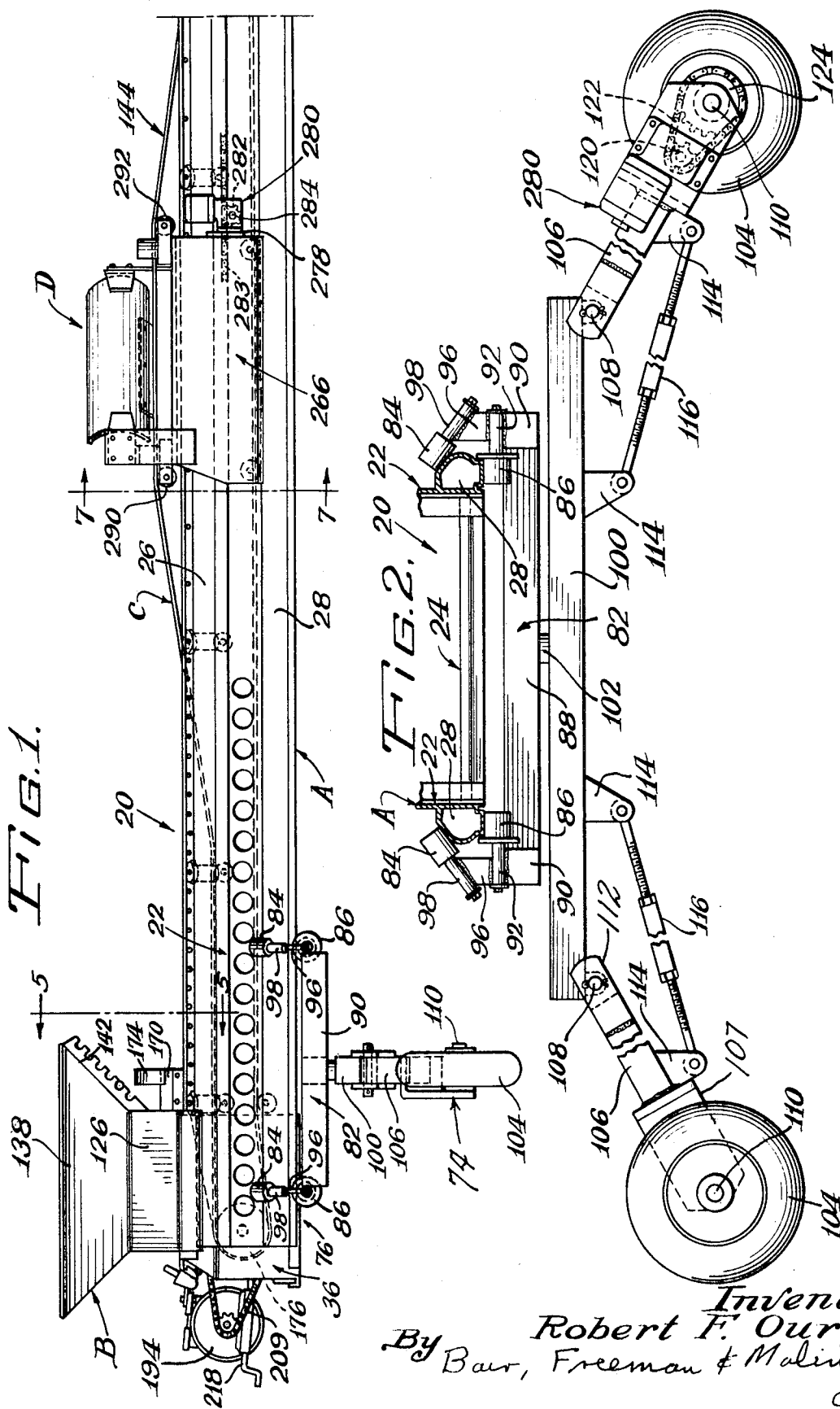
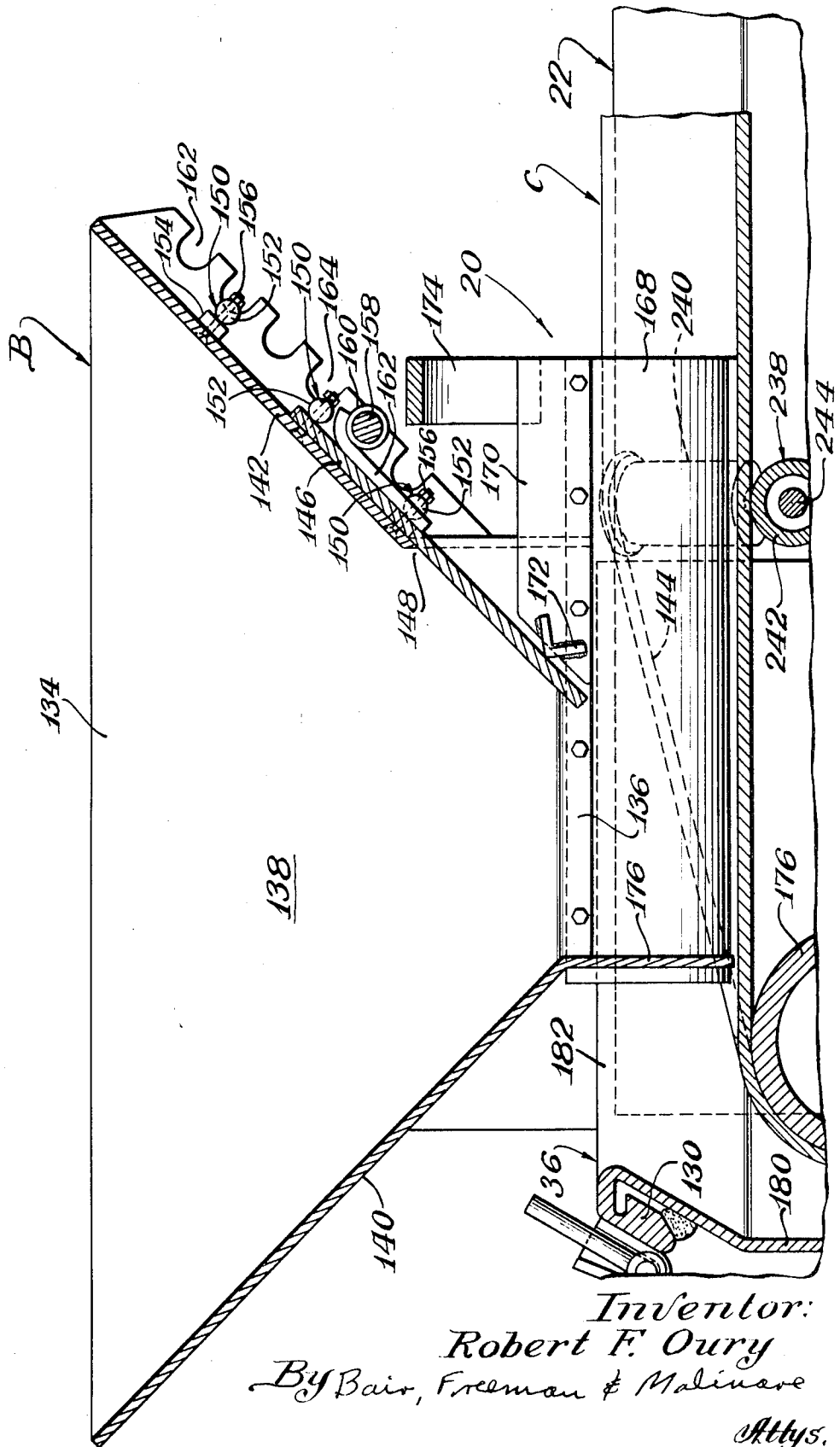


FIG. 6.



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FIG. 9.

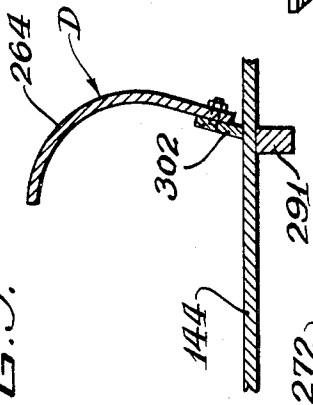
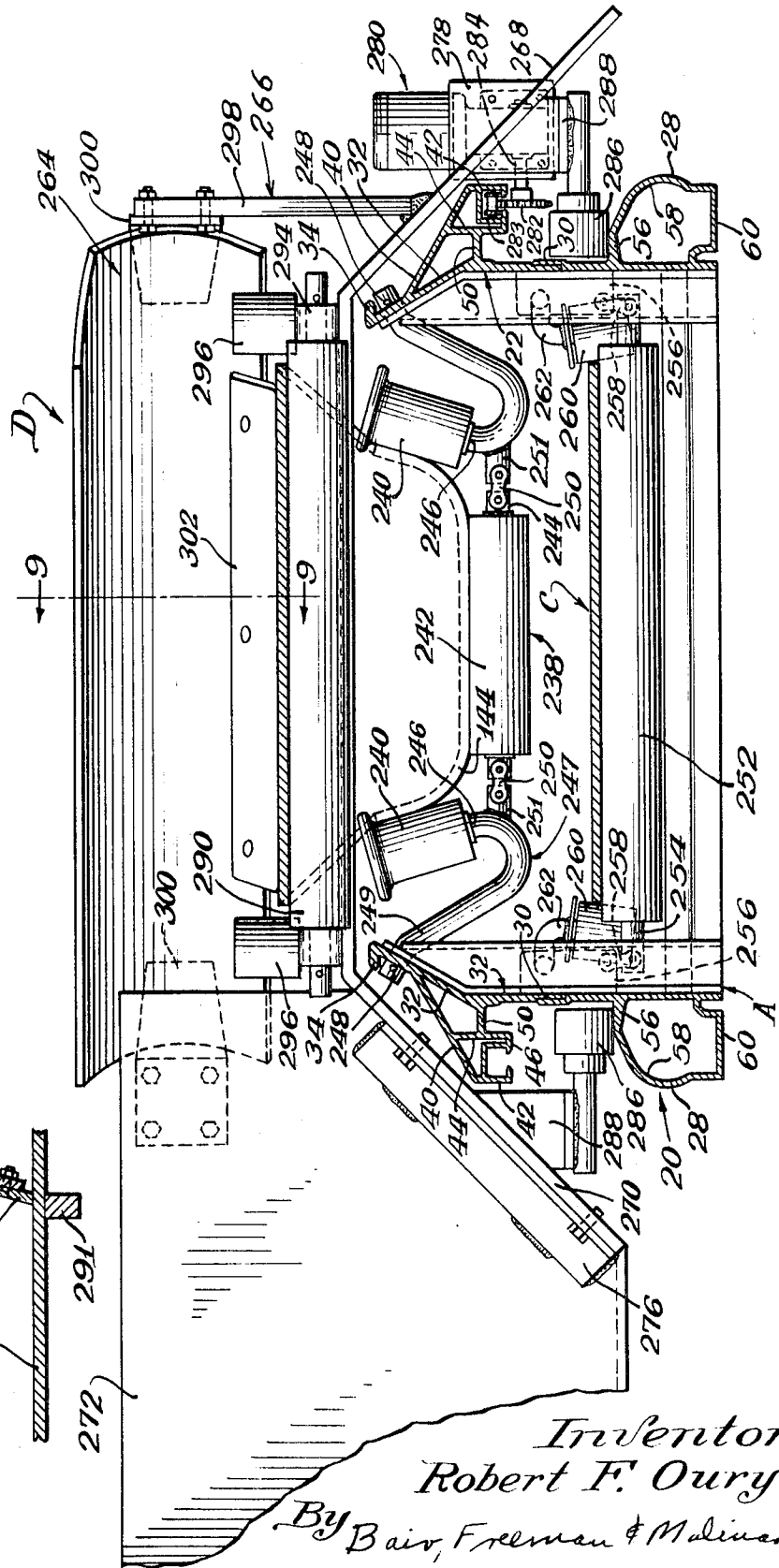


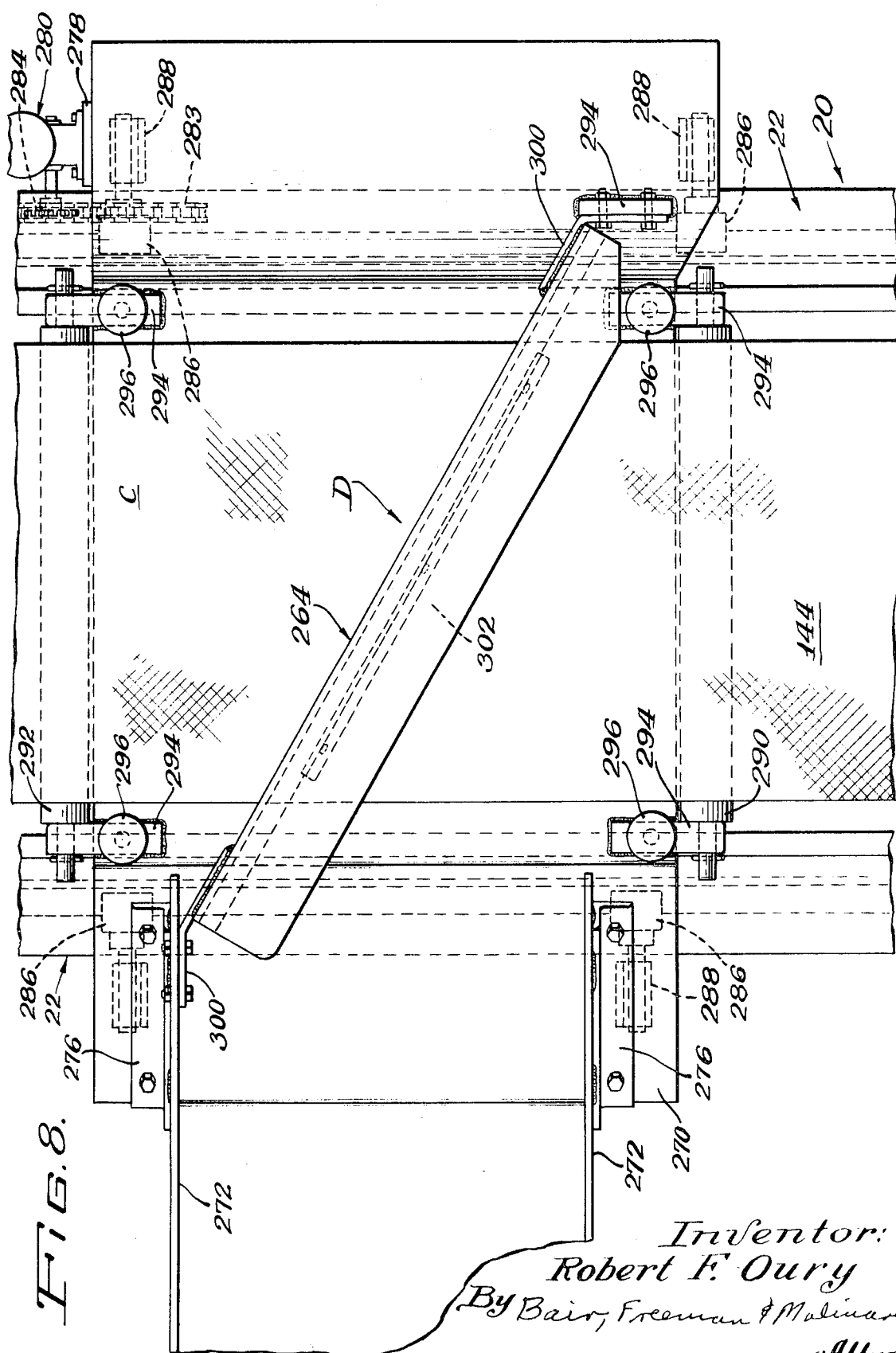
FIG. 7.



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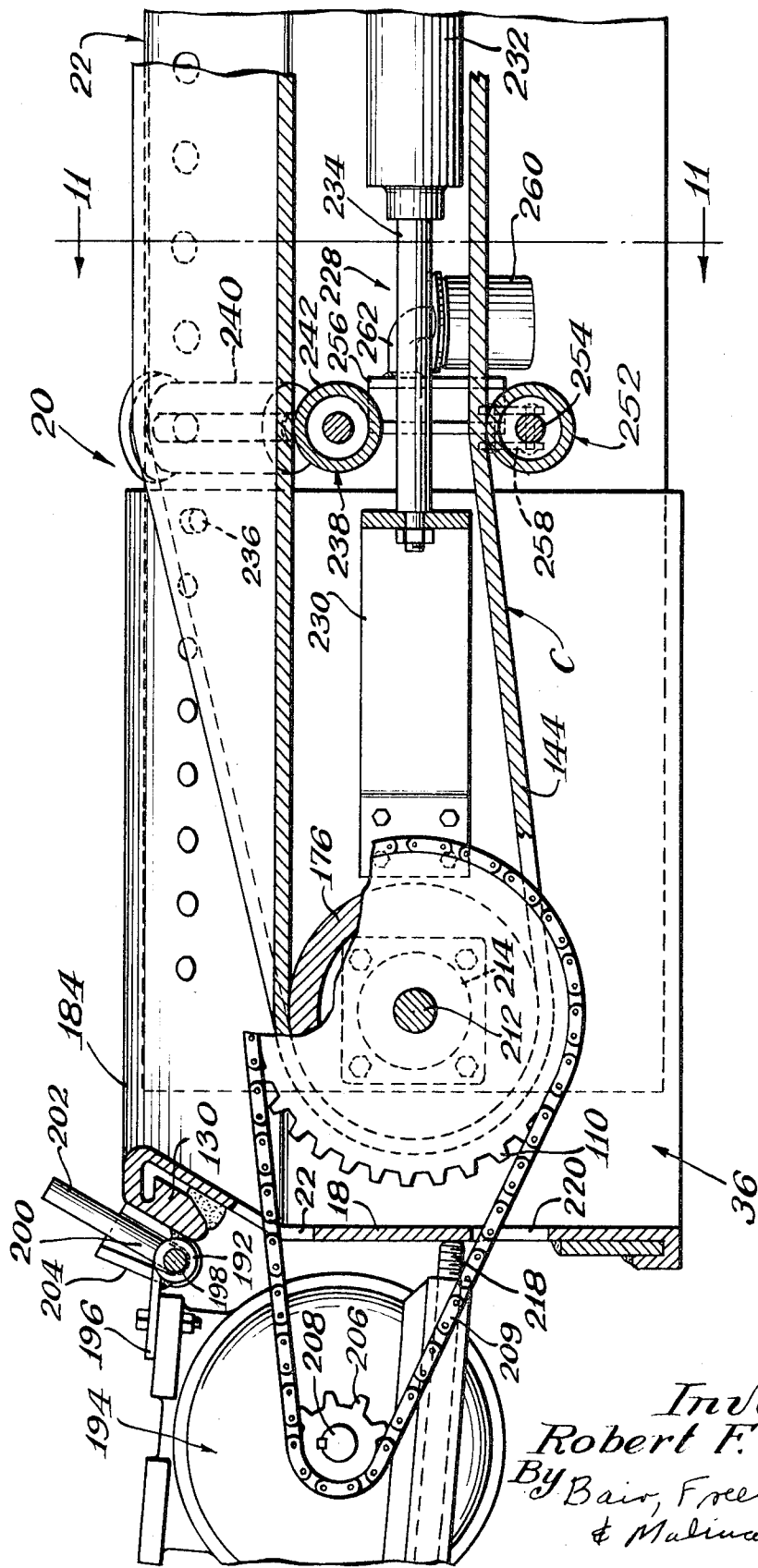
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FIG. 10.



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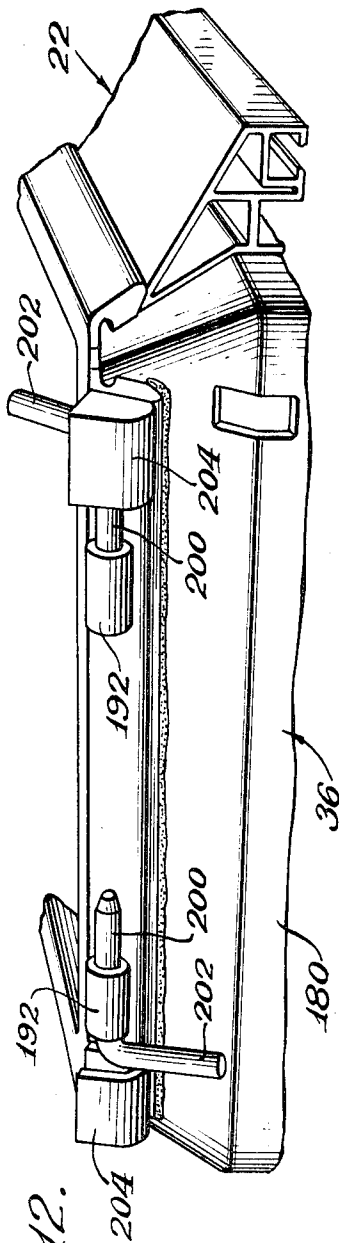


FIG. 12.

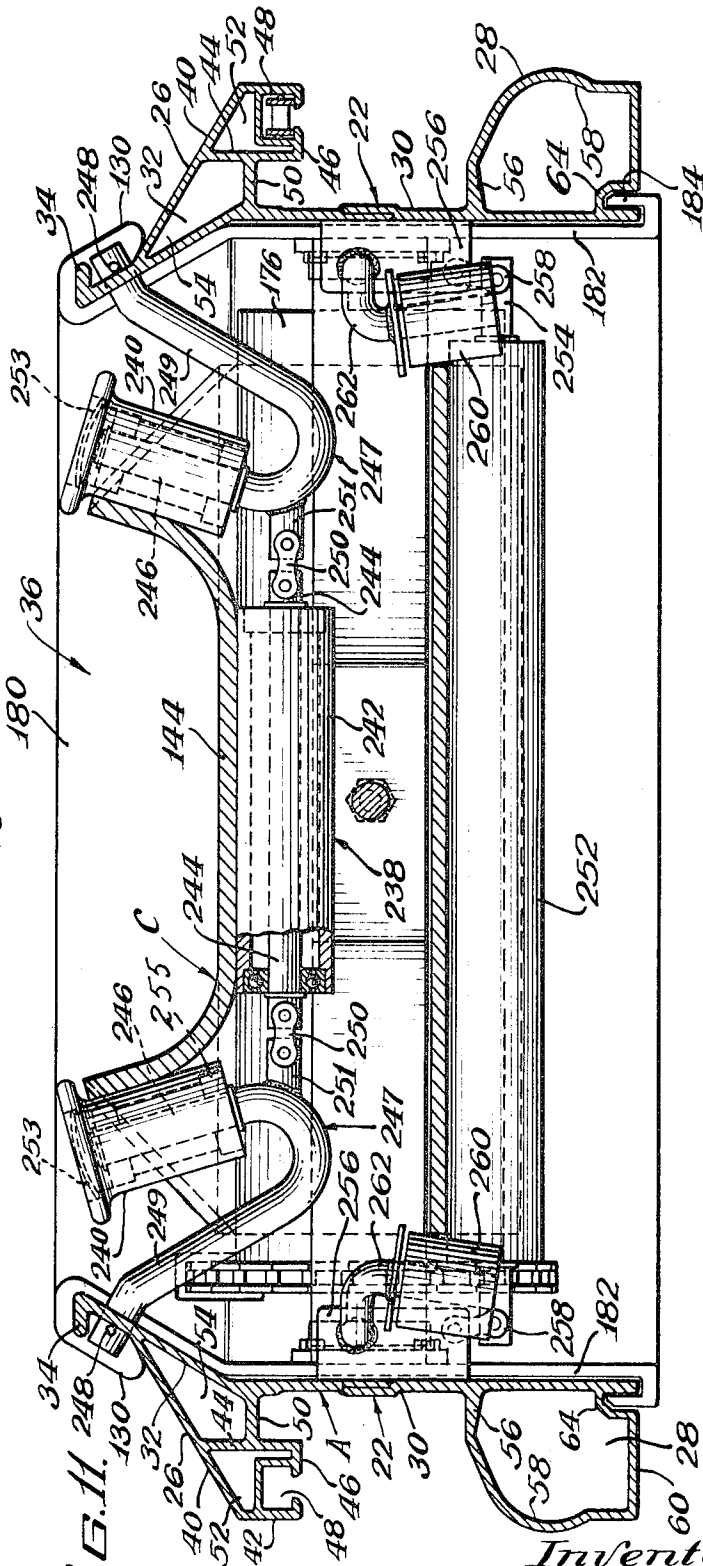
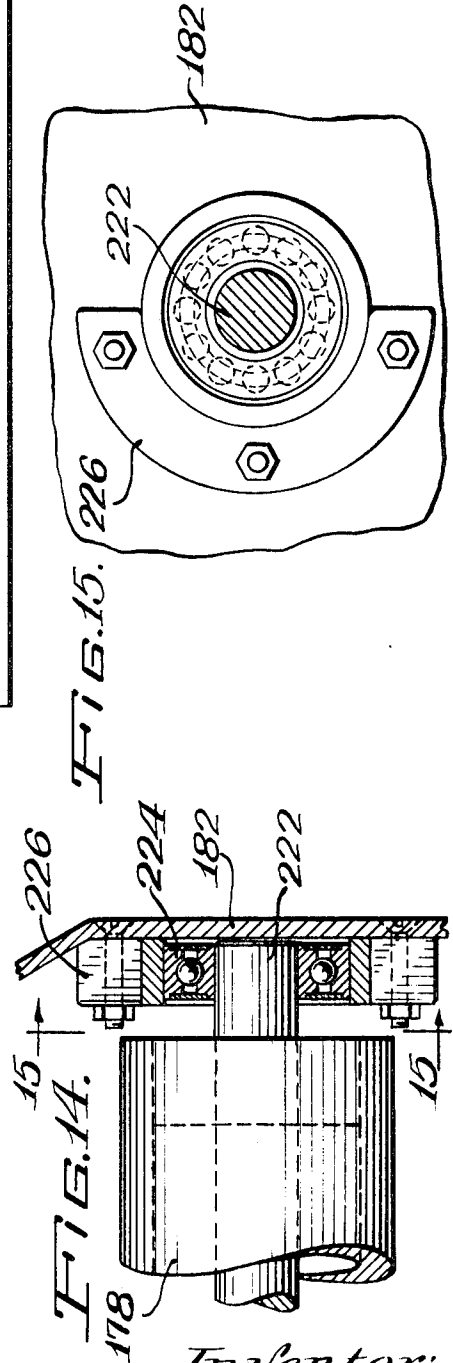
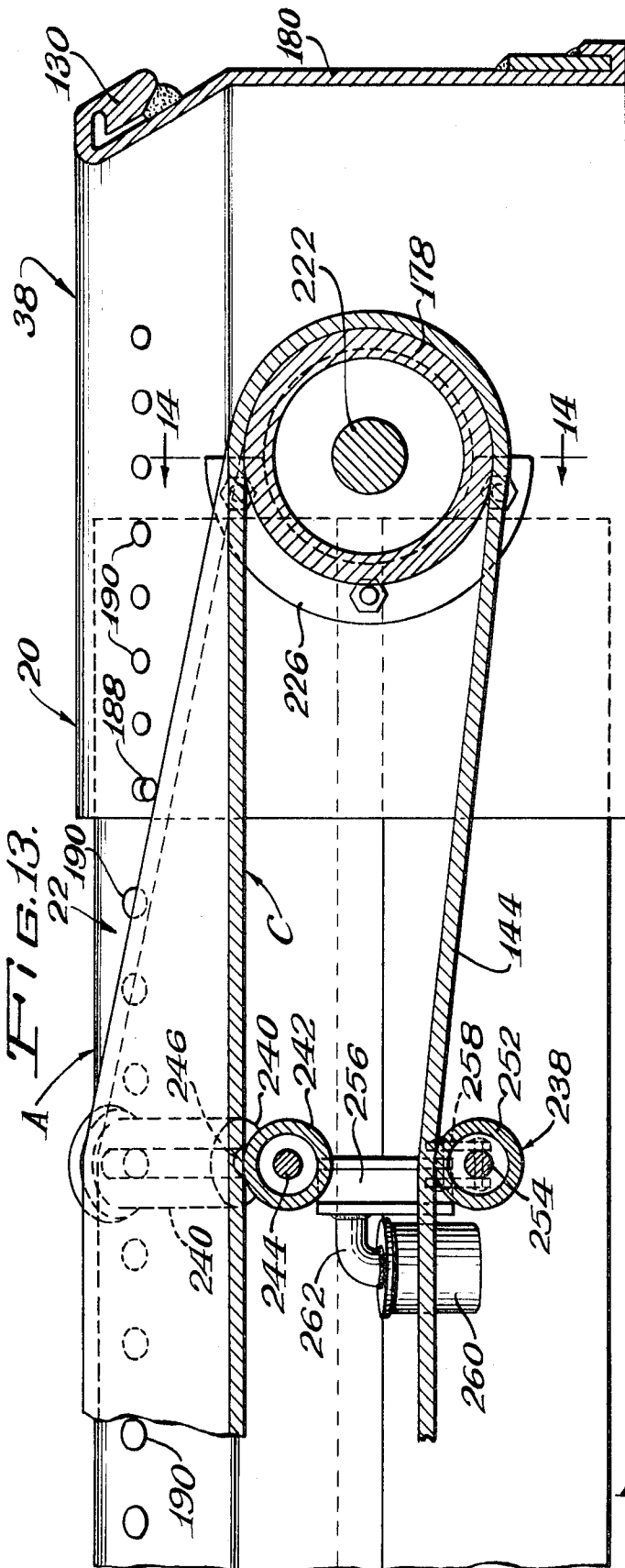


FIG. 11.

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CONCRETE CONVEYOR

BACKGROUND OF THE INVENTION

Field of the Invention and Description of the Prior Art

This invention relates to a conveyor mechanism particularly useful for conveying a semifluid mass, such as concrete mix, from one location to a spaced location where the concrete is used.

The use of belt-type conveyors for transporting semifluid materials such as concrete mix, gravel, sand, and the like, have been known and used for several years. Typical of such concrete conveyors are those found in Oury et al. U.S. Pat. No. 3,151,732, Oury U.S. Pat. No. 3,171,534, and Oury Pat. No. 3,203,538.

All of such known prior art concrete conveyor structures, however, have been so constructed as to convey the material from one end of a conveyor belt all the way to the discharge end where the material is dropped longitudinally off the end of the conveyor belt. It has been common practice to use those conveyor structures in tandem so that the material from one conveyor is discharged onto the conveyor belt of a second conveyor at a point intermediate its opposite ends from where the material is carried to the discharge end where it is dropped longitudinally off the end of the belt. Although this system has proven to be quite satisfactory, it is also desirable to provide a concrete conveyor construction wherein the discharge point for the concrete mix on the conveyor may be readily moved to a different position. This may be accomplished by use of a movable plow.

The use of movable plows with a belt conveyor mechanism has been known for some time. The Lundbye, U.S. Pat. No. 2,099,071 and Behrens et al. U.S. Pat. No. 3,156,170 both show paving machines wherein movable plows are so used. The Lundbye patent shows a belt supported in a U-shape and the plow scrapes the U-shaped belt. The Behrens patent shows a flattened belt for improved discharge. It is preferred to use a U-shape belt to prevent the concrete from falling off the sides of the belt during transfer from a receiving point to a discharge point. A flattened belt at the plow is preferred, however, to provide a substantially clean wiping of the belt. Paving machines, such as shown by Lundbye and Behrens, generally do not convey the concrete for long distances and at relatively high speeds, such as 1,000 feet per minute. Because of the long distances and high speeds used in the elongated concrete conveyor mechanisms shown by the Oury patents, movable plows have not generally been used therewith. Because of the high speed required for portable concrete conveyors and the necessity to wipe the conveyor belt substantially clean of concrete, the use of plows for concrete has not been fully satisfactory. It would therefore be highly desirable to provide a movable plow on a conveyor moving at high speeds and accomplish a complete and thorough cleaning and wiping of the concrete from the belt, while still avoiding the damaging wear characteristics that would normally be attendant to this type of scraping action.

Known conveyors for transporting concrete over long distances also have various other drawbacks and disadvantages. Supporting structures used for such conveyors have a tendency to collect the semifluid concrete being moved on the conveyor, which material hardens in place on the conveyor. This creates an unsightly condition and there also in an adverse effect on the operation of the mechanism such as: telescoping of the conveyor, travelling of the plow wheels on the conveyor frame, and rubbing of hardened concrete against the conveyor belt itself. This hardened concrete also adds to the already heavy equipment and the equipment becomes increasingly difficult to move from place to place. Generally, support structures or frames for elongated conveyors have not been specifically designed for their intended purpose. Prior art support frames have not provided the desired adjustability, strength, while being light in weight, etc.

SUMMARY OF THE INVENTION

It is therefore an important object of this invention to provide an improved apparatus for conveying material, such as concrete mix, wherein many disadvantages of the prior art devices are substantially avoided.

It is also an object of this invention to provide a mobile conveyor apparatus for conveying or transporting concrete mix from one location to another location, wherein the discharge point of the concrete from the conveyor may be readily changed from one place to another on the conveyor and concrete is discharged without causing separation of the concrete aggregate from the fluid portion of the mix.

It is a further object of this invention to provide an improved conveyor apparatus for concrete wherein the apparatus is characterized by its simplicity and economy of construction, manufacture, and operation.

It is still a further object to provide a concrete conveyor assembly which has an improved frame specifically designed for use in concrete conveyor assemblies.

It is also another object to provide an improved frame for an elongated conveyor assembly wherein the frame is designed to avoid concrete buildup, is strong but light in weight, and provides adjustability for the length of the conveyor and for the conveyor belt supports.

It is still a further object of this invention to provide an improved conveyor apparatus having hollow upper and lower frame sections which act as passageways for electric cables, drive chains, and the like.

It is yet another object of this invention to provide an elongated and mobile concrete conveyor apparatus having a movable metering hopper for receiving relatively small surges of concrete from the feeding source and having a spaced concrete discharge point which is substantially immovable along the longitudinal axis of the conveyor, while the concrete is being transported to the discharge point.

It is yet a further object of this invention to provide improved assemblies for supporting the conveyor belt relative to the frame, the assemblies cooperating with the frame structure to be readily moved from one support position to another.

Further purposes and objects of the foregoing invention will appear as the specification proceeds.

BRIEF DESCRIPTION OF THE DRAWINGS

One embodiment of the present invention is illustrated in the accompanying drawings wherein:

FIG. 1 is a side elevational view of the hopper end of my improved concrete conveying apparatus showing the concrete receiving hopper and the movable plow mounted on the conveyor frame;

FIG. 1A is a side elevational view showing the outer end of the conveyor mechanism of FIG. 1;

FIG. 2 is a fragmentary, cross-sectional view taken along the line 2-2 of FIG. 1A, showing the wheel frame used for transporting the apparatus of FIG. 1 along a horizontal surface;

FIG. 3 is an interior, side view of the cross-support members for the conveyor support frame of the apparatus of FIG. 1;

FIG. 4 is a cross-sectional view taken along the line 4-4 of FIG. 3, showing details of the cross-support frame;

FIG. 5 is an enlarged cross-sectional view taken along the line 5-5 of FIG. 1, showing the hopper for receiving concrete;

FIG. 6 is an enlarged transverse, cross-sectional view taken along the line 6-6, showing the internal structure of the hopper;

FIG. 7 is an enlarged cross-sectional view taken along the line 7-7 of FIG. 1, showing the plow for diverting the concrete from its normal path of travel to a place of use;

FIG. 8 is a top plan view of the plow shown in FIG. 7;

FIG. 9 is a detailed cross-sectional view taken along the line 9-9 of FIG. 7, showing the preferred shape of the plow structure for scraping the concrete conveyor belt;

FIG. 10 is an enlarged cross-sectional view of the support frame of FIG. 1 with the concrete receiving hopper removed, particularly showing the drive mechanism for the conveyor belt;

FIG. 11 is a cross-sectional view taken along the line 11-11 of FIG. 10, showing the conveyor belt mounting structure,

FIG. 12 is a perspective view of the structure used for mounting the belt drive motor on the support frame;

FIG. 13 is an enlarged transverse cross-sectional view of the end of the conveyor frame which is opposite to that of FIG. 10;

FIG. 14 is a sectional view taken along the line 14-14 of FIG. 13, showing the mounting for the idler roller of the belt conveyor; and

FIG. 15 is a fragmentary cross-sectional view taken along the line 15-15 of FIG. 14.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the description of the apparatus shown in the drawings, for purposes of simplicity, the apparatus will be described as being for the conveying of concrete mix. However, the apparatus may be used for conveying other materials, although the principal use of the mechanism is intended to be for the transportation of a concrete mix from one location to a second location spaced at a substantial distance from the first location.

Referring to FIGS. 1 and 1A, my improved concrete conveying apparatus generally 20, includes a support frame A, a hopper B for receiving the fluid concrete mix, a conveyor C for transporting the concrete mix from the hopper B, and a plow D for removing concrete from the conveyor C and diverting it laterally off of the frame A. Each of these principal structural components will be described in detail.

Referring particularly to FIGS. 1, 1A, 3, 4, and 11, each support frame A includes a pair of spaced, elongated, horizontal side members 22 which are interconnected by a plurality of cross-support members, generally 24, seen best in FIGS. 3 and 4. The side members 22 each include an upper portion 26 and a lower portion 28. A substantially planar intermediate, integral portion 30 interconnects the upper and lower portions 26 and 28. The upper portion 26 and the lower portion 28 both have a cross-sectional shape which permits construction by extrusion techniques, preferably by extrusion of aluminum. The upper and lower portions 26 and 28 both are of a hollow construction to provide for minimum weight, but yet provide maximum torsional strength.

The upper hollow portion 26 of each of the side members 22 includes an upwardly and inwardly inclined wall portion 32 which extends from the upper end of the upright planar portion 30. The wall 32 terminates with an outwardly extending upper lip 34 which cooperates with slidable frame end portions 36 and 38 to permit sliding movement therebetween. The structure of the frame ends 36 and 38 will be described hereinafter in greater detail.

A slanted or tapered and outwardly extending wall 40 extends from the wall 32 from a point spaced downwardly from the upper lip 34. The wall 40 terminates in an upright, outer wall 42. An intermediate upright wall 44 extends downwardly from the central portion of the slanted wall 40 and terminates at a bottom wall 46, which interconnects the outer upright wall 42 and the intermediate upright wall 44. The bottom wall 46 has an elongated continuous open chamber 48 defined therein for receiving a drive chain for the plow D. A substantially horizontal wall 50 extends outwardly from the planar portion 30 to the central portion of the intermediate wall 44. The horizontal wall 50 provides structural stability for the outwardly projecting hollow upper section 26. The hollow portions 52 and 54 defined in the upper section 26 may also be used for receiving electrical cords or the like to avoid contamination with concrete or the like or to avoid becoming tangled with other equipment. The upper hollow section 26, as will be hereinafter described in greater detail, is a load supporting structure which has maximum strength and durability and yet provides a lightweight structure.

The hollow lower section 28 of each side member 22 includes a horizontal wall 56 extending outwardly from the planar portion 30. The wall 56 is continuous with a curved

outer wall 58 which extends along the outer side of the hollow section 28. A bottom horizontal wall 60 interconnects the planar section 30 with the curved wall 58. The bottom wall 60 includes an open upright chamber 64 adjacent the planar portion 30. The upright chamber 64 receives guide portions of the slidable frame end portions 36 and 38 for sliding movement therebetween. The hollow lower section portion 28 is a load bearing member and the structure provides for minimum weight with maximum strength.

Advantageously, the upper and lower side frame sections 26 and 28 are extruded of aluminum in two separate pieces and are welded together at the central section of the planar portion 30, as best shown in FIG. 11. However, the frame can be extruded in one piece. Further advantages of the described structure are that the upper surfaces of the upper and lower side frame portions 26 and 28 are generally tapered or angled downwardly so that material being moved on the conveyor, such as wet concrete mix or the like, coming in contact with it will drip or fall off. By this structure, there is no excessive buildup of hardened concrete on the structure to cause the apparatus 20 to become excessively heavy and thereby to cause difficulty in moving the apparatus 20 from place to place.

A plurality of cross frame members, generally 24, rigidly interconnect the side frame members 22. As shown in FIG. 3, the crossmembers 24 include an upright channel member 66 having outwardly extending flanges 68 through which bolts are passed for securing the channel 66 in an upright position to the inner surfaces of each of the side members 22. A cross member 70, of hollow construction, passes between each pair of channel members 66. The cross support 70 is welded to the lower ends of each channel member 66 so that a pair of upright channel members 66 and a horizontal cross support 70 comprise an integral frame unit for interconnecting the side members 22. Any desired number of the crossbeam assemblies 24 may be used, depending upon the overall length of the apparatus 20 in order to provide the desired structural rigidity. It is important for each crossbeam 70 to have an upper wall 72 which is slanted downwardly so that there will be no buildup of concrete mix thereon to adversely affect the weight or operation of the apparatus 20 and thereby its mobility.

In order to provide the desired mobility of the apparatus 20 so that it may be readily moved from one location to the other, a wheel assembly 74 is provided at the hopper end 76 of the elongated frame A and another wheel assembly 78 is provided at the opposite end or outer end 80 of the frame A. The wheel assemblies 74 and 78 are each of substantially the same construction so that it will be necessary to describe only one of the assemblies in detail.

Referring to FIGS. 1A and 2, the wheel assembly 78 at the outer end 80 of the frame A is shown. The assembly 78 includes substantially an H-shaped horizontal frame 82 carries upper guide rollers 84 and lower guide rollers 86. The frame 82 includes a crossbeam 88 and a pair of integrally connected side beams 90. The opposite or outer ends of each of the side beams 90 fixedly carry journal members 92 which rotatably carry horizontally positioned lower rollers 86, which engage and ride along the lower sides of the bottom walls 60 of the hollow lower sections 28 of the frame side members 22. The outer ends of each of the side beams 90 also include upright brackets 96 generally positioned above the lower journals 92. The upper ends of the brackets 96 fixedly carry journals 98 which are inclined upwardly and inwardly toward the support frame A. The journals 98 rotatably carry upper rollers 84 which ride along the upper side of the curved outer walls 58 of each of the hollow sections 28 of the side members 22. The rollers 84 and 86 thereby cooperate to accomplish longitudinal adjustment between the wheel assemblies 74 and 78 to a desired position relative to the elongated support frame A. The mounting of the roller supports 84 and 86 also advantageously permits the movable plow D to pass back and forth across the top side of the wheel assembly 78.

A horizontal elongated wheel support beam 100 is pivotally connected to the underside of the H frame 82 by a swivel con-

nection 102. The swivel connection 102 permits the angular adjustment of the wheels 104 to be varied relative to the longitudinal axis of the frame A so that the apparatus 20 may be moved in any desired direction. Wheel support arms 106 are pivoted at 108 to the opposite outer ends of the wheel support beam 100. The lower ends of the arms 106 have wheel support brackets 107 fixedly mounted thereon. Wheels 104 are rotatably carried on axes 110 which extend laterally from the bracket supports 107. The upper ends 112 of the arms 106 are forked and straddle the opposite vertical sides of the wheel support beam 100. The lower inner side of each arm 106 and the underside of the support beam each include a support bracket 114 for receiving a turnbuckle 116. The provision of the turnbuckles 116 for each set of wheels makes it possible for an operator to vary the relative adjusted height of the wheel support frame A. Advantageously the wheel is aligned with the central axis of the arm 106.

My particular design of wheel frame 78 has many advantages. It permits adjustability for the height of the entire conveyor, it provides for adjustability of the distance between conveyor supports at opposite ends of the conveyor, and by varying the relative height of each frame 78, the angle of the conveyor relative to its supporting surface can be varied. Furthermore, the movable plow D is constructed to freely pass over the wheel assemblies.

A drive or gear motor reducer set 118 is rigidly mounted on a bracket 107 on one side of each wheel assembly 74 and 78. The drive set 118 turns a sprocket 120 which engages a drive chain 122. The drive chain 122 in turn engages a sprocket 124 which is fixedly secured to an axle 110. In this way, the drive set 118 provides powerized rotation for one wheel 104 of each of the assemblies 74 and 78, so that the conveyor apparatus 20 can be power driven along the ground to a place of desired use.

Referring to FIGS. 1, 5, and 6, the details of the hopper assembly B will be described in detail. The hopper assembly B includes a pair of upright support plate members 126 which are rigidly mounted to the upper portion of the slidable end portion 36 on the frame A. Pin members (not shown) are provided for securing the support members 126, in a fixed relative position, to the side frame members 22. The upright support plates 126 have outwardly and downwardly inclined lower portions 128 which are coextensive with the outer lips 130 of the slidable end portion 36. A horizontal angle iron 132 is welded to the inner surface of the upright support plate 126 and also to the upper lip 130 of the slidable end portion 36 to provide for a rigid mounting of the hopper assembly B upon the end portion 36.

The hopper B has an enlarged or wide open upper end 134 and a restricted or narrow open lower end 136 which are defined by upwardly and outwardly extending sidewalls 138, rear wall 140, and front wall 142.

In order to adjust the quantity of concrete mix, which is normally above a 4 inch slump and passes upon a conveyor belt 144 below the open lower end 136, an adjustable gate 146 is slidably mounted on the outer surface of the front wall 142. As shown in FIGS. 5 and 6, an enlarged rectangular opening 148 is provided in the front wall 142. The opening 148 is normally closed by the rigid gate 146. The gate 146 is held against the surface of the front wall 142 by a plurality of support assemblies 150 which are mounted in pairs on the front wall 142. The support assemblies 150 generally comprise short bolt members 152 which are rigidly spaced outwardly from the front wall 142 a distance equal to the thickness of the gate 146. Spacers 154 are mounted between the members 152 and the wall 142 and are secured in place by bolts 156. The gate 146 is thereby slidably received between the front wall 142 and the member 152.

The vertical adjustment of the gate on the front wall 142 is accomplished by a rod support 158 which is slidably carried by the gate 146. The gate 146 has a rigid hollow horizontal sleeve 160 secured to its front surface by a bracket 162. The sleeve 160 slidably receives the rod support 158. The outer

ends of the elongated rod support 158 engage the horizontally aligned recesses 164 defined along each of the front or forward edges of the upright support members 126. The support assemblies 150 thereby cooperate to maintain the gate 146 against the wall 142 while the rod support 158 and recesses 164 cooperate to maintain the gate 146 in desired vertical position relative to the opening 148 in the front wall 142.

The concrete mix passing from the open lower end 136 of the hopper B to the conveyor belt 144 is guided onto the belt 144 so that substantially all the mix is received on the belt and there is relatively little, if any, spilling of material. The rear tapered wall 140 includes a substantially upright portion extending from the open end 136 downwardly to a position immediately above the upper surface of the conveyor belt 144. The opposite sides of the open lower end 136 are provided with flexible guide members 168 supported on opposite sides of the opening 136. The flexible guides 168, constructed of a relatively heavy sheet rubber material or the like, are positioned over the upper surface of the conveyor belt 144, which is supported in a substantially U-shaped position immediately below the hopper B. Each of the flexible guides 168 are secured to support plates 170, which extend forwardly from the front wall 142 and which are rigidly secured thereto, by welding to bar members 172. The support plates 170 are rigidly interconnected at their outer ends by an inverted U-shaped support member 174, which is welded to the outer end of each of the flexible guide support plates 170. Thus, the rear vertical guide 166 and the side flexible guides 168 cooperate to guide substantially all of the concrete mix from within the hopper B to the upper surface of the U-shaped conveyor belt 144.

Referring particularly to FIGS. 10-15, details of the conveyor assembly C will be described. The conveyor belt 144 is a continuous belt constructed of a relatively heavy, flexible durable material commonly used for conveying concrete mix or the like. One end of the continuous belt 144 passes around a drive roller 176 rotatably mounted under the slidable hopper end portion 36 while the other end of the continuous belt 144 passes around an idler roller 178 which is rotatably carried by the slidable end portion 38 at the outer end of the frame A. Scraper members (not shown) may be provided to clean the belt after concrete is discharged therefrom. It is important that the rollers 176 and 178 be carried by the slidable frame end members 36 and 38 so as to provide for adjustment of the belt 144 to the desired tension.

Each of the frame end portions 36 and 38 are generally constructed in the same manner. Each end portion comprises a continuous rigid planar rear wall 180 which interconnects a pair of rigid planar sidewalls 182. The sidewalls 182 are slidably carried interior of the side members 22 of the frame A. The sidewalls 182 include the upper lip 130 which slidably encompasses or engages the lip or flange 34 on each upper hollow portion 26 on the side members 22 and also include a lower upright lip 184 which slidably engages the continuous upright chamber 64 of each bottom wall 60 of the lower hollow section 28 of the side members 22. As shown in FIG. 13, the slidable outer end portion 38 may be fixed relative to the frame A (similar to fixing the hopper B on the frame 20) by inserting a pin 188 through an aperture provided in the sidewalls 182 and in a selected aperture 190, a plurality of which are staggered along the upper portions of the side members 22 to give minute adjustment, as shown best in FIG. 13.

The combination of the side frames 22 and end portions 36 and 38 being located above the belt protects the belt and thereby the concrete carried thereon from wind interference.

The outer wall 180 of the slidable member 36, as shown best in FIGS. 10 and 12, has support sleeves 192 mounted thereon, as by bolting, for carrying the drive or gear motor reducer set 194 which drives the drive roller 176 of the conveyor belt 144. The drive set 194 has a support plate 196 secured to its upper side. A pair of sleeves 198 are secured to and extend inwardly from the support plate 196. The hollow sleeves 198 slidably receive rigid mounting pins 200 which are slidably carried in

the hollow mounting sleeves. As shown best in FIG. 12, an integral arm 202 extends at right angles to the main body of each pin 200. When the arm 202 is turned to the downward position, the arm 202 is trapped between the bracket support 192 and a stop member 204 which is secured to the outer wall 180. In this position, the pin 200 is received by the sleeve 198 so as to lock the drive assembly 194 in place to the slidable member 36. When the pin is moved to the raised position and withdrawn into the hollow pocket defined in the stop member 204, the pins 200 are released from engagement with the sleeves 198 so that the drive set 194 may be removed from the slidable member 36. Thus, a simple mounting structure is provided for removably carrying the motor assembly 194 on the frame A.

The drive set 194 rotates a sprocket 206 which is fixed to a motor shaft 208. The sprocket 206, in turn, engages a drive chain 209 which engages a sprocket 210 fixedly secured to a pulley assembly 212. The pulley assembly 212 is rotatably carried by journal members 214 secured to the inner surfaces of the sidewalls 182 of the slidable member 36. The drive roller 176, through the drive motor 194, sprockets 206 and 210, pulley assembly 212, and the drive chain 209, drives the belt conveyor 144 at a desired speed. In order to adjust the tension on the drive chain 209, a threaded member 218 has its inner end abutting the outer wall 180 of the slidable member 36. In this way, the relative position of the drive set 194 may be pivoted about the pivot mounting of the drive set on the support pins 200. The rear wall 180 of the slidable member 36 also has apertures 220 therein to permit the passage therethrough of the drive chain 209.

The conveyor belt 144 is positioned on the frame A to facilitate the mounting and removal of the conveyor belt 144. The mounting of the idler roller 178 relies upon the tension of the belt 144 for securing the roller 178 to the slidable end 38. Referring to FIGS. 13-15, the idler roller 178 is rigidly mounted upon a shaft 222. The idler shaft 222 is rotatably received at its opposite ends in roller bearings 224 which in turn are received in semiannular support members 226 mounted on the inside of the slidable end 38. The semiannular supports 226 receive the inner sides of the roller bearings 224 so that the longitudinal tension of the conveyor belt 144 pulls the bearings 224 and shaft 222 into tight engagement with the semiannular supports 226. As the tension is relieved on the belt 144, the roller bearings 224 and the shaft 222 and idler roller 178 are readily separated from the slidable end portion 38. By removing the roller 178, the belt 144 may be easily handled for repair, cleaning, adjustment, or the like. This structure also facilitates mounting of a new belt 144 on the apparatus 20. The belt 144 is joined together after being placed on the apparatus and by the described structure the operator can work with maximum slack in the belt and yet it is simple to adjust the belt to the desired tension.

Hydraulic adjusting apparatus, generally 228, is mounted on the support frame A between the side members 22 and is rigidly connected to a bracket 230 which is secured to the slidable end portion 36, as shown in FIG. 10. The hydraulic apparatus 228 comprises a hydraulic cylinder 232 carried by a frame support (not shown having a piston rod 234 extending outwardly therefrom. The piston rod 234 is fixed to the bracket 230. After the belt 144 has been loosely positioned on the apparatus and it has been passed around the drive roller 176 and idler roller 178, the hydraulic apparatus 228 mechanically drives the slidable end member 36 outwardly in a longitudinal direction so as to apply powerized tension to the belt. When the desired tension has been applied to the belt, a pin 236 is placed into suitable apertures on opposite sides of the slidable member 36 and the pins 236 are received in two of the apertures 190 on the side members 22, one on the top and one on the bottom, thereby locking the slidable end 36 in the desired position.

The operating portion of the conveyor belt 144 is generally supported in a U-shape so that semifluid material, such as concrete mix, does not fall from the belt conveyor 144. As

seen most clearly in FIG. 11, the operating or conveying portion of the belt 144 is supported at a plurality of places along the entire length of the frame A by multiple roller assemblies 238. Each roller assembly 238 comprises a central, substantially horizontal roller for supporting the central portion of the belt, and a pair of upwardly and outwardly slanted side support rollers 240. The side rollers 240 cooperate with the lower roller 242 to define the desired U-shape for carrying the concrete mix in the belt 144. The horizontal roller 242 is rotatably carried on a horizontal shaft 244 and the side rollers 240 are rotatably carried on tapered shafts 246 which are portions of U-shaped supports 247. The second upright legs 249 of each support 247 are nonrigidly carried within an aperture provided in the upper ends of the frame side members 22. Hairpins 248 pass through the upper ends of upright legs 249 for securement thereof to the frame A. The bight portion of each support 247 is welded rigidly to a stub shaft 251, each of which is nonrigidly interconnected to the horizontal shaft 244 by chain link members 250. Each roller assembly 238, as described, is flexibly or nonrigidly mounted on the frame so as to resist abuse during operation of this unit. By the described structure for the roller assembly 238, when the belt conveyor 144 moves up along one of the angular rollers 240 because of misalignment, the idler roller will take a natural cant in the direction of the belt. This cant creates a directional force which induces the belt 144 to move into the center of the idler assembly 238, thereby providing a self-adjusting feature. When the idler assembly 238 and belt 144 are operating properly, the weight of the concrete holds the diagonal idlers in the proper position and substantially no loss of drive power for the conveyor results.

Advantageously, each of the slanted rollers has an enlarged circular upper end portion. A cap 253 is also preferably provided to protect the internal bearings 255 from contamination. The enlarged upper end portion, when contacting the upper edge of the belt 144, causes the roller assembly 238 to cant forward so only the enlarged bell-shaped portion contacts the belt edge. As the roller revolves, the belt is pulled in tighter to the bell section. With the roller canted in this direction, the belt cannot continue its upward movement and the cant has a downward directing force on the belt.

Horizontal return idlers 252 are mounted below the idler assemblies 238 and support the conveyor belt 144 in its return movement to the hopper B. The return idlers 252 are resiliently mounted by securement of the outer ends of the idler shafts 254 to support rods 256 through chain links 258. The upper ends of the rods 256 are secured to suitable apertures in the frame side 22 by hairpins. The idlers 252 are rotatably carried on the shafts 254 by bearing members (not shown). In order that the belt 144 in its return movement remains in proper alignment throughout its entire length, a pair of substantially upright side idlers 260 are positioned on opposite sides of the conveyor belt 144 and engage the side edges thereof. The side idlers 260 are rotatably carried on shafts 262 which are rigidly welded to the rods 256. Preferably the side idlers 260 are positioned closely adjacent the horizontal return idlers 252. The idler assemblies 238, the side idlers 260, and the return idlers 252, are all easily detached and mounted on the frame A by the use of hairpins. This not only facilitates removal and mounting of a new conveyor belt 144 upon the apparatus 20, but it also facilitates the removal of worn idlers and the mounting of new idlers on the apparatus. Still further, this mounting enhances machine operation because the nonrigid mounting enables the conveyor assembly C to generally withstand shocks and general hard use.

Desirably, scrapers (not shown) are used to clean the belt and prevent the buildup of contamination. The carrying side of the belt is first scraped shortly after the concrete mix is discharged. Scrapers are also advantageously provided to clean the inside surface of the belt and to clean the rollers at opposite ends of the conveyor belt 144.

Referring to FIGS. 1 and 7-9, the details of the movable plow assembly D will be described in detail. A belt scraper 264

is rigidly mounted upon a movable carriage 266. The carriage 266 includes a motor side plate 268 which tapers downwardly over the side members 22. The opposite side of the carriage 266 includes a downwardly tapered side plate 270 similar to the side plate 268. Both sideplates 268 and 270 extend completely over the side members 22. A pair of rigid upright side guides 272 are mounted on the side plate 270 and extend upwardly therefrom in order to guide the concrete mix being diverted from the conveyor belt 144. The side plates 272 are mounted on the diagonally and downwardly extending side plate 270 by a pair of rigid upright members 276 which are removably bolted to the upper side of side plate 270. The upper surface of the side plate 270 and the side guides 272 define a funnel for receiving concrete mix passing from the conveyor belt 144 and for guiding the mix to the place of ultimate use.

An upright motor mounting plate 278 is rigidly secured to the diagonal side plate 268 and a drive or gear motor reducer set 280 is rigidly mounted on the outer side of the mounting plate 278. A sprocket 282 is rigidly secured to the drive shaft 284 of the motor set 280 in order to provide powerized movement of the carriage 266 along the side members 22. The sprocket 282 engages a link chain 283 which is received within the channel 48 and is anchored at its opposite ends. The sprocket 282 by engaging the fixed chain 283 causes the plow D to traverse the frame 20. Idler rollers 286 are rotatably mounted on the side plates 268 and 270, through brackets 288, so that in response to the movement of the sprocket 282, the carriage assembly 266 readily traverses along the side members 22 so that the plow assembly D may be moved to any desired location relative to the elongated frame A.

The movable carriage 266 includes leading and trailing horizontal idler rollers 290 and 292 for supporting the belt conveyor 144 in a substantially flattened condition as the belt 144 moves into position for removal of concrete therefrom at the area of the scraper 264. Each of the rollers 290 and 292 is rotatably carried by support blocks 294 rigidly secured in pairs to the upper side of the side plates 268 and 270. A pair of side idlers 296 are also rotatably mounted adjacent the idlers 290 and 292 in order to assure lateral alignment of the conveyor belt 144 relative to the guide rollers 290 and 292. By flattening the belt conveyor 144 as the concrete mix is removed therefrom, there is assurance that substantially all of the concrete will be removed from the belt and the concrete mix will remain in the desired mixed condition with substantially no undesirable separation of aggregate in the concrete slurry. After the roller 290, running perpendicular to the longitudinal axis of the belt, has levelled the belt, a supporting bar 291 mounted parallel to and in front of the scraper blade, supports the belt 144 from below with an even pressure along the entire line of the scraper. With this bar in a consistent parallel position to the plow, an even pressure plane is obtained for the plow scraper blade 302 against the belt. Thus, a true plane of pressure is obtained with no high pressure points.

The scraper 264 is secured in a position diagonal of the longitudinal axis of the conveyor belt 144. The scraper 264 is secured on one side to an upright support plate 298 which is welded to the upper surface of the side plate 268 of the carriage 266. The opposite side of the diagonally mounted plow is secured to a bracket 300 which, in turn, is removably secured to the upright side guide 272.

The scraper 264 is shaped, in cross section, substantially as a semicircle. This particular construction is important in order to assist in maintaining the concrete mix in a proper mixture without separation of the aggregate from the concrete slurry. It is important to provide a hardened lower scraper blade 302 which is flat and engages the upper surface of the conveyor belt 144. The blade 302 is removably secured to the semicircular portion of the scraper blade assembly 264. The scraper blade 302 is positioned approximately at a 15° angle to the upper side of the belt. This angle provides a natural lifting to the concrete mix as it enters the pocket formed in the scraper 264 and substantially eliminates pressure which naturally

develops at the point of contact between the belt and the scraper caused by the weight of the concrete. The concrete that is lifted off of the belt 144 by the blade and into the pocket of the scraper then flows into the discharge port or funnel formed by the guide members 272.

Although it is believed that the operation of the described apparatus 20 is apparent from the foregoing description, a brief explanation of the operation will be provided for a full understanding of the invention. Although it is conceivable that a plurality of the concrete conveyors 20 may be used in tandem arrangement, that is, a plow assembly D on one apparatus 20 may be raised a sufficient height to discharge concrete mix into the hopper assembly B of another apparatus 20 or directly onto the belt 144, the following explanation will describe the apparatus 20 only in use as a single unit.

When it is desired to use the concrete conveyor apparatus 20 for pouring concrete in the foundation of a building, at a dam site, or the like, the entire conveyor apparatus may be moved along the ground by the operator causing the drive sets 118 on each of the wheel assemblies 74 and 78 to drive the wheels 104 to provide powerized movement of the apparatus 20 to the desired location. Because of the swivel connection 102 between the frame A and the hopper wheel assembly 74 and 76, one end of the frame A may be moved independent of the other end of the frame, so that the hopper end 76 of the frame A may be positioned at a location accessible to receiving the concrete, such as a place where ready-mix concrete trucks pour concrete into the hopper B. The other end of the apparatus 20 may be located where the concrete may be discharged from the plow assembly D to the desired place of use.

After the apparatus 20 has been moved to the desired location with the hopper end 76 and the outer end 80 in the desired general location, the operator then adjusts the desired location of the movable plow assembly D on the frame A. The operator operates the drive set 280 to drive the sprocket 282 and thereby cause the movable carriage 266 to traverse the elongated side members 22 until the plow assembly D is at the desired location for directing concrete to a desired place of ultimate use. When the hopper assembly B and the plow assembly D have been placed in the desired location, ready-mix concrete trucks may pour large quantities of concrete into the hopper assembly B. The hopper B is constructed to store relatively large quantities of concrete therein so that a continuous supply of concrete is assured for passage to the conveyor C. There is assurance, therefore, that the hopper supply control gate will maintain a continuous flow of concrete to the belt. At the area of the hopper B, the conveyor belt 144 moves about the drive roller 176 in a substantially horizontal position, but immediately is moved into a substantially U-shape by contact with the substantially U-shaped roller assembly 238 at a position below the open lower end 136 of the hopper B. By providing a wide open upper end 134 and the relatively small open end 136, the contact area between the belt 144 and the concrete in the hopper is relatively small so that the power requirements for the drive assembly is minimized. In other words, the belt 144 does not support the entire weight of the concrete mix within the hopper. If more concrete is desired to be placed into the hopper, the gate 146 is adjusted upwardly along the front wall 142 of the hopper.

The concrete on the conveyor belt 144 is maintained in place therein without substantially any spillage because of the U-shape of the conveyor until it moves into the area of the plow assembly D. The combination of the belt shape and the frame sides and ends also provides protection of the moving concrete from wind interference. The belt conveyor 144 is then moved into a substantially flat condition between the leading and trailing horizontal rollers 290 and 292 carried on the movable carriage 266. Because of the relatively fast movement of the belt, there is substantially no spilling of the concrete mix in the short space during which the belt is flat before the concrete is intercepted by the scraper blade.

The concrete, intercepted by the scraper blade 302, is again mixed within the pocket formed in the scraper 264 before it is discharged through the chute or funnel formed by the side guides 272 laterally of the carriage 266. The concrete is then directed to the place of ultimate use.

After the belt passes the horizontal trailing roller 292, it may again be moved into a substantially U-shape because all the roller assemblies 238 supporting the belt in its operating position between the drive roller 176 and the idler roller 178 are the U-shaped assemblies 238. The belt passes around the idler roller 178 and is moved to the starting position back at the hopper B. During this return movement, the belt 144 passes over the horizontal idler rollers 252 and the lateral movement of the belt 144 is maintained at a minimum by the side idlers 260.

While in the foregoing there has been provided a detailed description of a particular embodiment of the present invention, it is to be understood that all equivalents obvious to those having skill in the art are to be included within the scope of the invention as claimed.

What I claim is:

1. Apparatus for continuously conveying a fluid mass, such as concrete mix, from a first location to a second location, said apparatus comprising, in combination, an elongated support frame, movable belt means for continuously conveying said mass along a path of travel from said first location to said second location, support assemblies for said belt means, cooperating means on said frame and on said assemblies for adjustably mounting said assemblies on said frame, means on said frame for diverting spilled portions of said fluid mass therefrom, means positioned on said support frame for continuously diverting said mass from said path of travel to said second location, a cooperating means on said frame and on said diverting means for driving said diverting means to a desired location on said frame, a rigid hopper, a frame end member slidably mounted on said support frame and carrying said hopper to permit relative adjustment of said hopper longitudinally of said frame, and cooperating means on said hopper and on said frame for locking said hopper in place on said frame.

2. The apparatus of claim 1 wherein a fluid cylinder is mounted between said support frame and said end member for adjusting the relative longitudinal position of said end member on said support frame.

3. The apparatus of claim 2 wherein drive means are mounted on said end member for operating said belt means.

4. Apparatus for continuously conveying concrete mix, from a first location to a second location, said apparatus comprising, in combination, an elongated support frame having rigidly interconnected, spaced upright side frame members, said side frame members being defined by an upper hollow section, a lower hollow section below said upper section, and a substantially planar section interconnecting said hollow sections, said sections cooperating to provide reduced frame weight with enhanced torsional strength for said side members, said upper section terminating in an inwardly inclined flange and having a top surface adjacent said flange inclined downwardly and outwardly to cause concrete contacting said section to fall away from the apparatus and movable belt means mounted on said support frame for conveying said mix from said first location to said second location.

5. Apparatus of claim 4 in which said inclined flange contains openings spaced along the length thereof.

6. Apparatus of claim 5 including a series of three roller supports for said movable belt, each comprising a central horizontal shaft, a roller on said shaft, and a pair of U-shaped support shafts pivotally connected to the opposed ends of said central shaft near the curved portion thereof, a roller mounted on the leg of said U-shaped shaft nearest said central shaft, the other leg of said U-shaped shaft being disposed in one of the openings in said inclined flange, whereby said belt is non-rigidly supported from said side frame members with its opposed edges turned up to form a trough.

7. Apparatus of claim 6 in which said rollers on the U-shaped shaft terminate in a circumferential flange which serves as a stop for the edge of said belt.

8. Apparatus of claim 5 including a frame end member having sidewalls slidably mounted on said side frame members, openings spaced along said sidewalls, and pin means for locking said frame end to said side frame members through aligned openings in said flanges and said sidewalls.

9. The apparatus of claim 8 including a hopper resting on said frame end member, said hopper including at least one upwardly and outwardly slanted wall portion having an opening therein directly over said belt means and having a gate member adjustably mounted on said wall for varying the amount of conveyor belt exposed to the concrete flow and the quantity of the fluid mass being directed onto said belt means.

10. Apparatus of claim 5 including a frame end member slidably mounted on said support frame, said frame end member having sidewalls that mate with the inner surfaces of said side frame members, openings in said sidewalls which match the openings in said inwardly inclined flange, pin means cooperating with said openings for locking said frame end to said support frame by passing the pin through aligned openings in the sidewall and flange, and drive means mounted on said frame end member including a driven roller for said belt means, whereby the tension on said belt may be adjusted by sliding said frame end and locking it to said support frame.

11. Apparatus of claim 4 including a carriage having wheels riding on said lower hollow sections as rails, to permit moving the carriage along said support frame, and a pair of ground engaging wheels pivotally connected to said carriage to support said apparatus and facilitate moving it over the ground.

12. Apparatus of claim 11 in which said wheels are adjustably mounted to permit raising and lowering the apparatus with respect to the ground.

13. Apparatus of claim 11 in which one of said wheels is driven by a motor and drive assembly mounted thereon.

14. Apparatus of claim 5 including plow means movable along the length of the support frame and in which said upper hollow section has a longitudinal channel formed in the underside thereof, a link chain fixedly mounted in said channel, a carriage for said plow means having wheels riding on the surface of said lower hollow section, drive means carried by the carriage including a sprocket cooperating with said chain to drive said plow along the apparatus.

15. Apparatus of claim 14 including an electrical cable disposed in one of said hollow sections to carry power to said drive means.

16. Apparatus of claim 4 which includes a frame end member slidably mounted on said support frame, a roller rotatably mounted on said frame end for driving said belt, drive means carried entirely by said frame end for driving said roller, and means for locking said frame end to said support frame, whereby the tension on said belt may be adjusted solely by sliding said frame end to move said roller, and locking the frame end to said support frame.

17. The apparatus of claim 16 including a hydraulic cylinder interposed between said support frame and said slidable frame end member to assist in adjusting tension on said belt.

18. The apparatus of claim 16 wherein said drive means includes a motor detachably connected to said frame end by means of manually removable pins.

19. The apparatus of claim 4 including a first frame end portion slidably mounted at one end of said elongated frame, a second slidable frame end portion mounted at the other end of said frame, roller members for supporting said belt means mounted on each of said slidable end portions and drive means mounted on one of said frame end portions to drive the belt.

20. Apparatus of claim 4 which includes a concrete distributing attachment, drive means coacting with said attachment and said support frame including a longitudinal channel formed in the underside of said upper hollow section, a link chain fixedly mounted in said channel, and a sprocket

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connected to said drive means and meshed with said chain to produce relative motion between the conveyor and the attachment.

21. Apparatus of claim 4 including plow means, including a scraper blade, movable along the length of the support frame, a carriage for said plow means having wheels riding on one of said hollow sections, and a support bar carried by said carriage and extending beneath the movable belt means in front of said plow to support the belt.

22. A concrete conveyor comprising an elongated support frame having rigidly interconnected spaced upright side frame members, said side frame members being defined by an upper hollow section, a lower hollow section below said upper sec-

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tion and a substantially planar section interconnecting said hollow sections, said upper section being generally triangular in shape and having a top surface inclined downwardly and outwardly to shed concrete that falls on the frame member, the inner wall of said upper hollow section terminating in a flange projecting upwardly and inwardly, a frame end member slidably mounted on each end of said support frame over said flanges, a belt pulley rotatably mounted on each said end frame member, a conveyor belt trained on said pulleys, drive means mounted on one of said frame end members to drive the pulley thereon, and means on said flanges and the adjacent portion of said end frame for locking the frame to the flange.

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