Sept. 9, 1969 S. J. GARTNER ET AL 3,465,867

CHAIN AND INDEXING DRIVING MECHANISM

Filed June 14, 1967 7 Sheets-Sheet 1

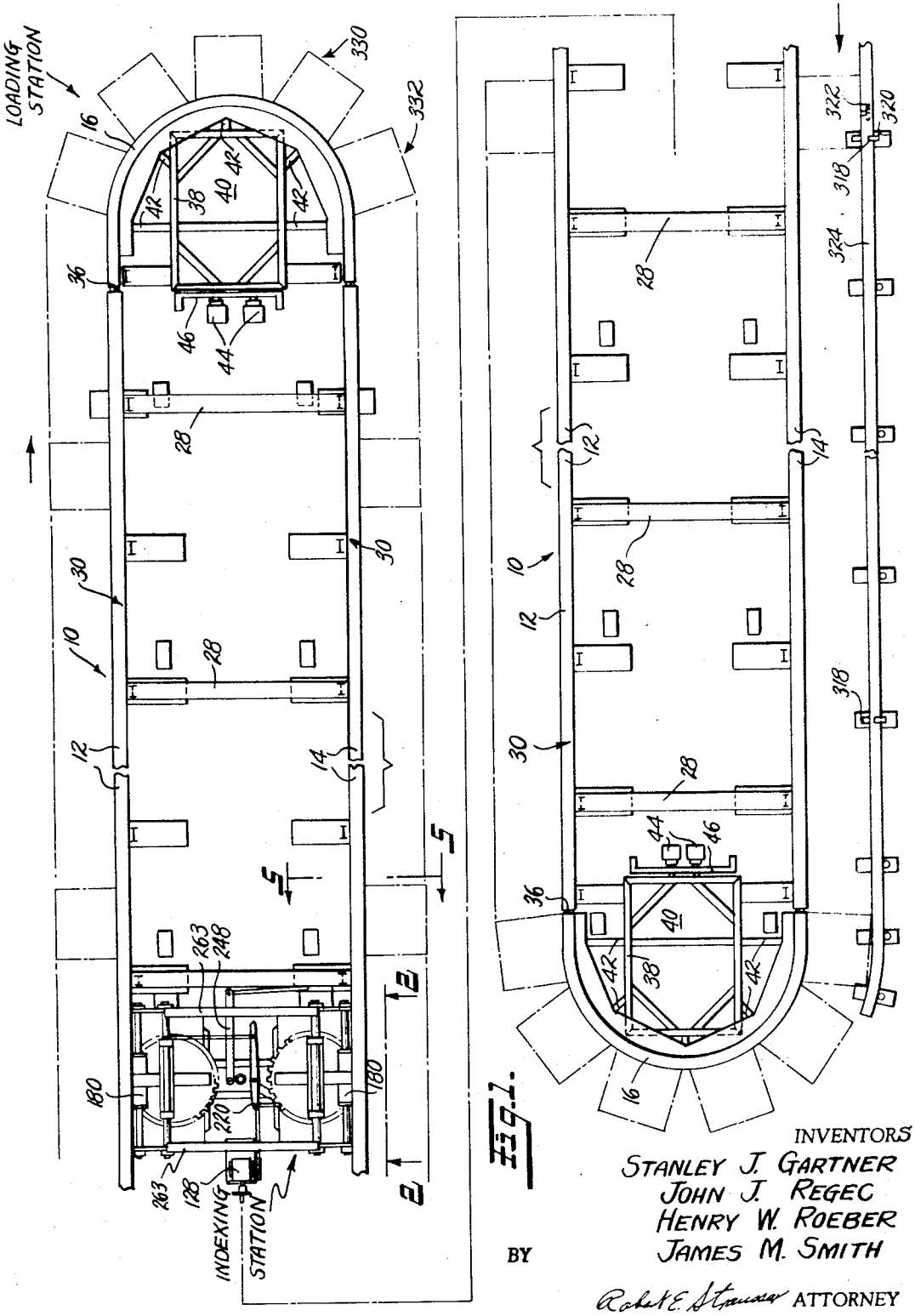


FIG. 1.

INVENTORS
STANLEY J. GARTNER
JOHN J. REGEC
HENRY W. ROEBER
JAMES M. SMITH

BY Robert E. Strauss ATTORNEY

Sept. 9, 1969 S. J. GARTNER ET AL 3,465,867

CHAIN AND INDEXING DRIVING MECHANISM

Filed June 14, 1967 7 Sheets-Sheet 2

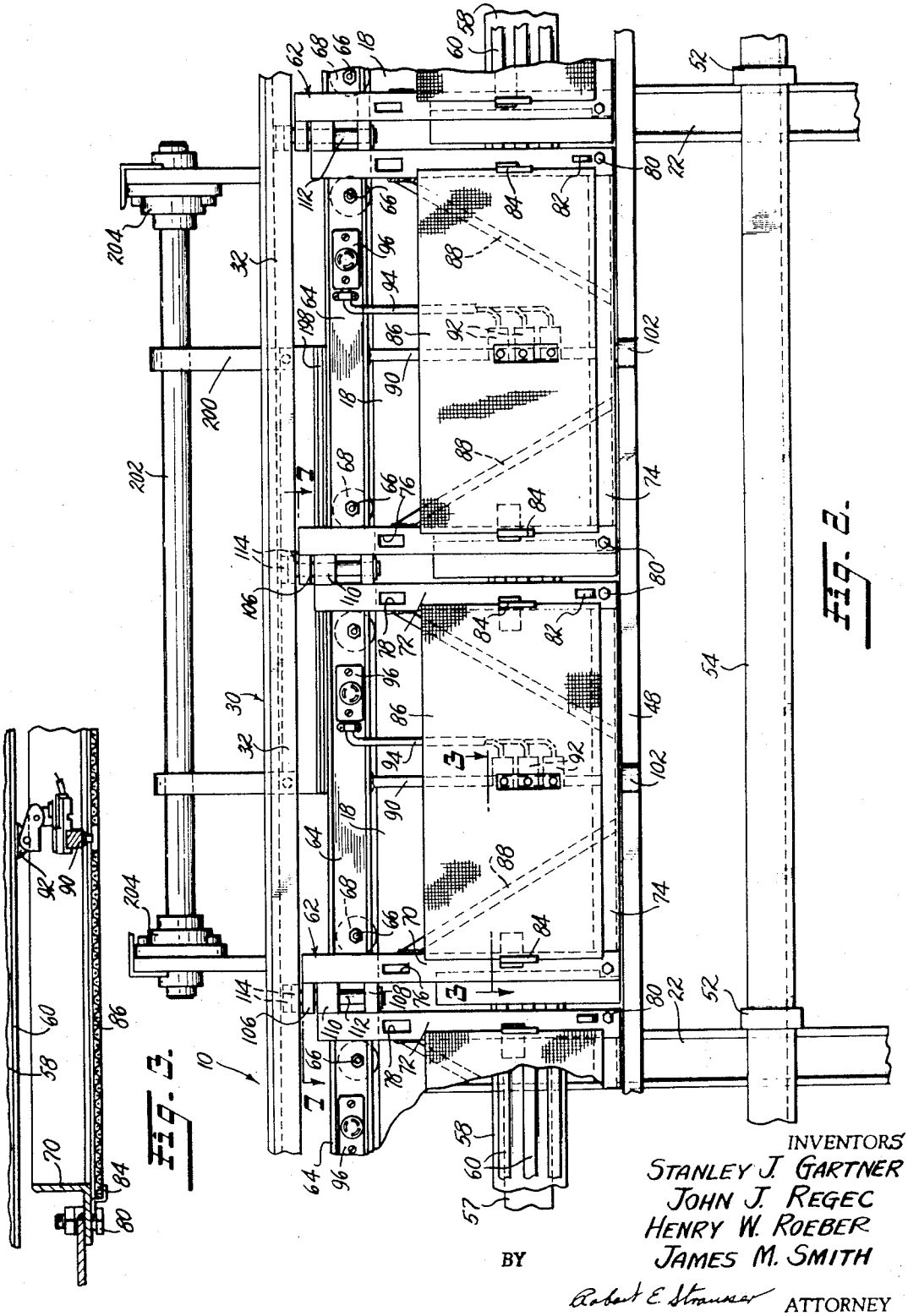


FIG. 2.

FIG. 3.

INVENTORS
STANLEY J. GARTNER
JOHN J. REGEC
HENRY W. ROEBER
JAMES M. SMITH

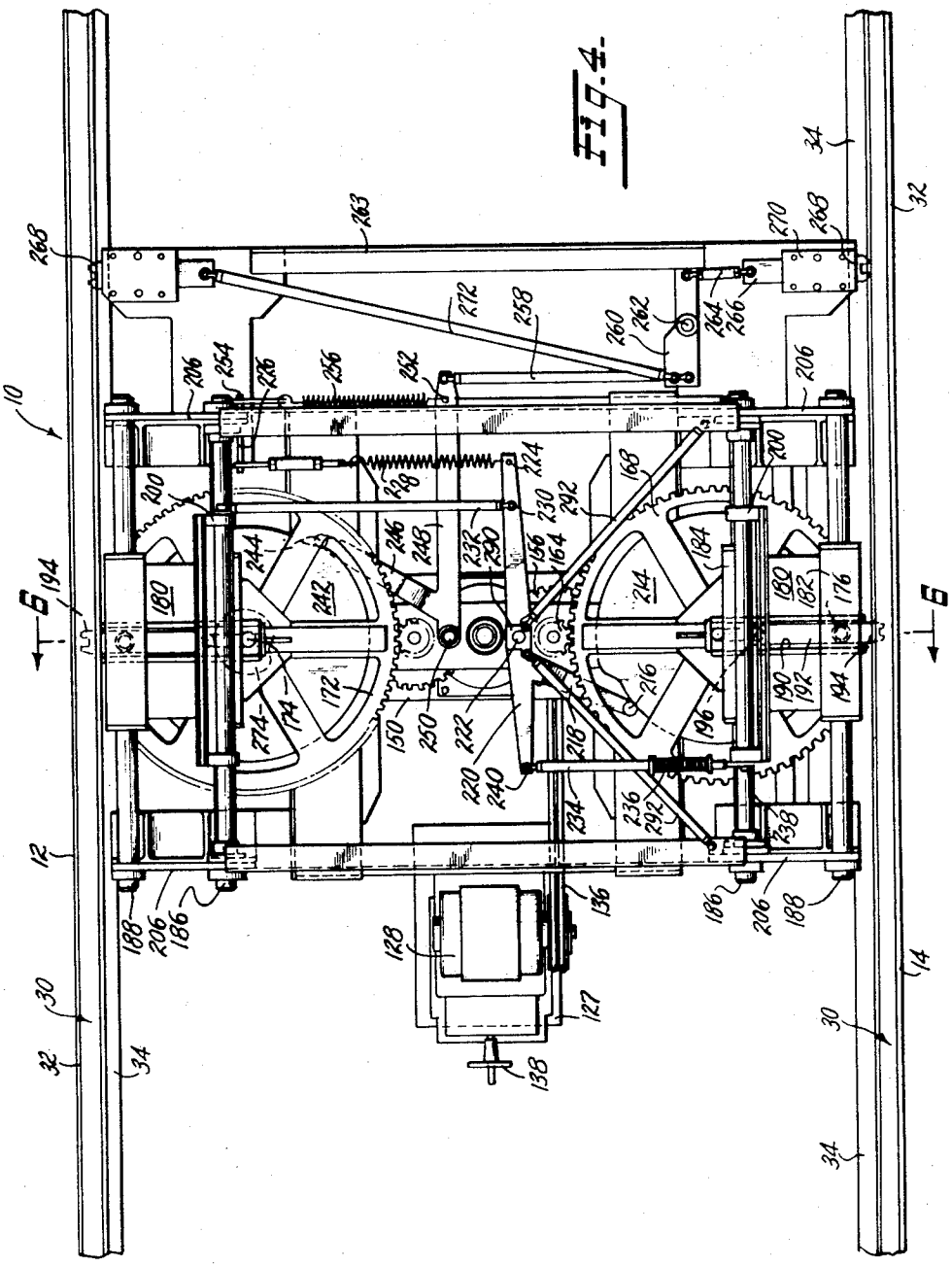
BY Robert E. Strauser ATTORNEY

Sept. 9, 1969 S. J. GARTNER ET AL 3,465,867

CHAIN AND INDEXING DRIVING MECHANISM

Filed June 14, 1967 7 Sheets-Sheet 3

FIG. 4.



INVENTORS
STANLEY J. GARTNER
JOHN J. REGEC
HENRY W. ROEBER
JAMES M. SMITH

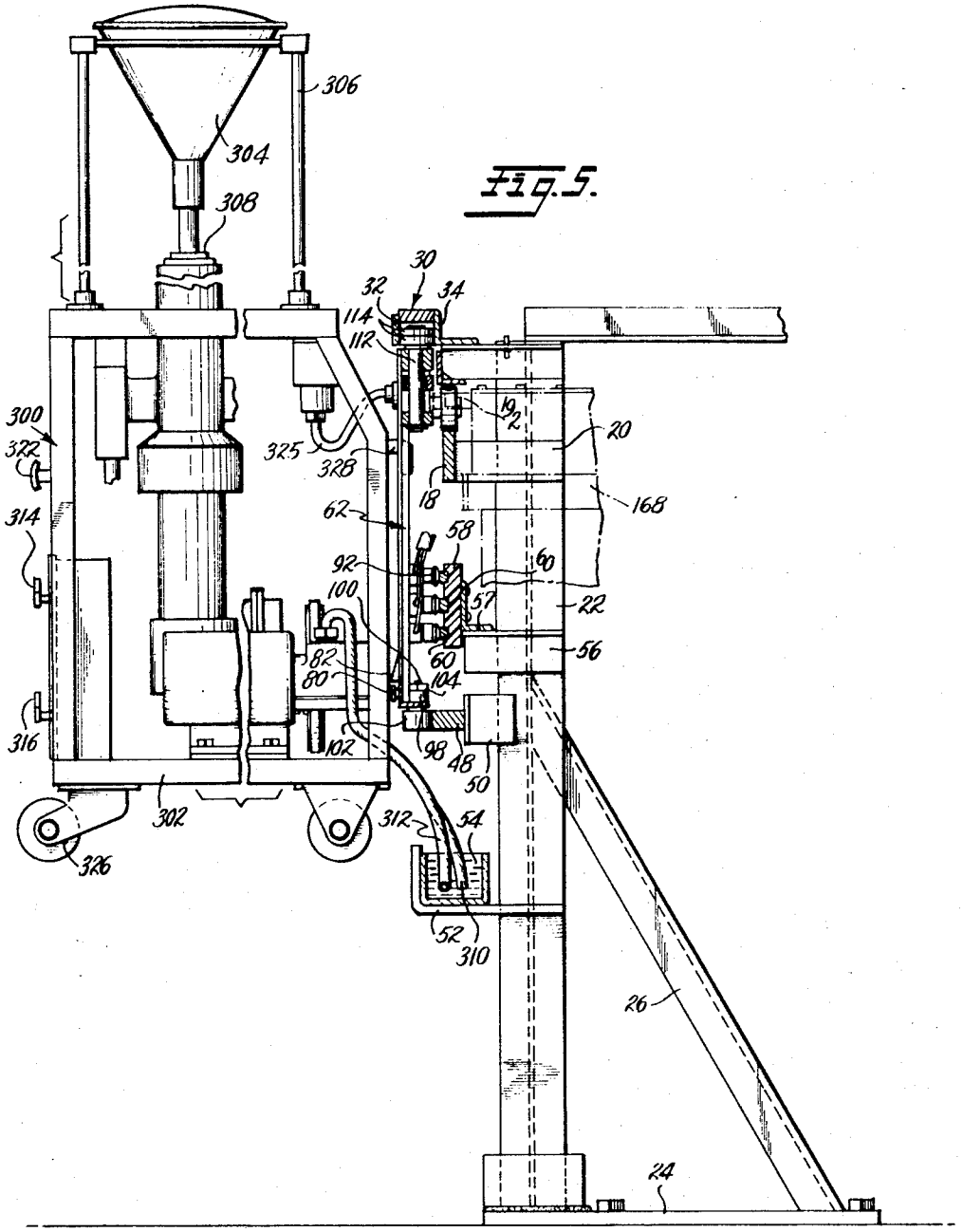
BY Robert E. Stanner ATTORNEY

Sept. 9, 1969 S. J. GARTNER ET AL 3,465,867

CHAIN AND INDEXING DRIVING MECHANISM

Filed June 14, 1967 7 Sheets-Sheet 4

Fig. 5.



INVENTORS
STANLEY J. GARTNER
JOHN J. REGEC
HENRY W. ROEBER
JAMES M. SMITH

BY Robert E. Hanson ATTORNEY

Sept. 9, 1969 S. J. GARTNER ET AL 3,465,867

CHAIN AND INDEXING DRIVING MECHANISM

Filed June 14, 1967 7 Sheets-Sheet 5

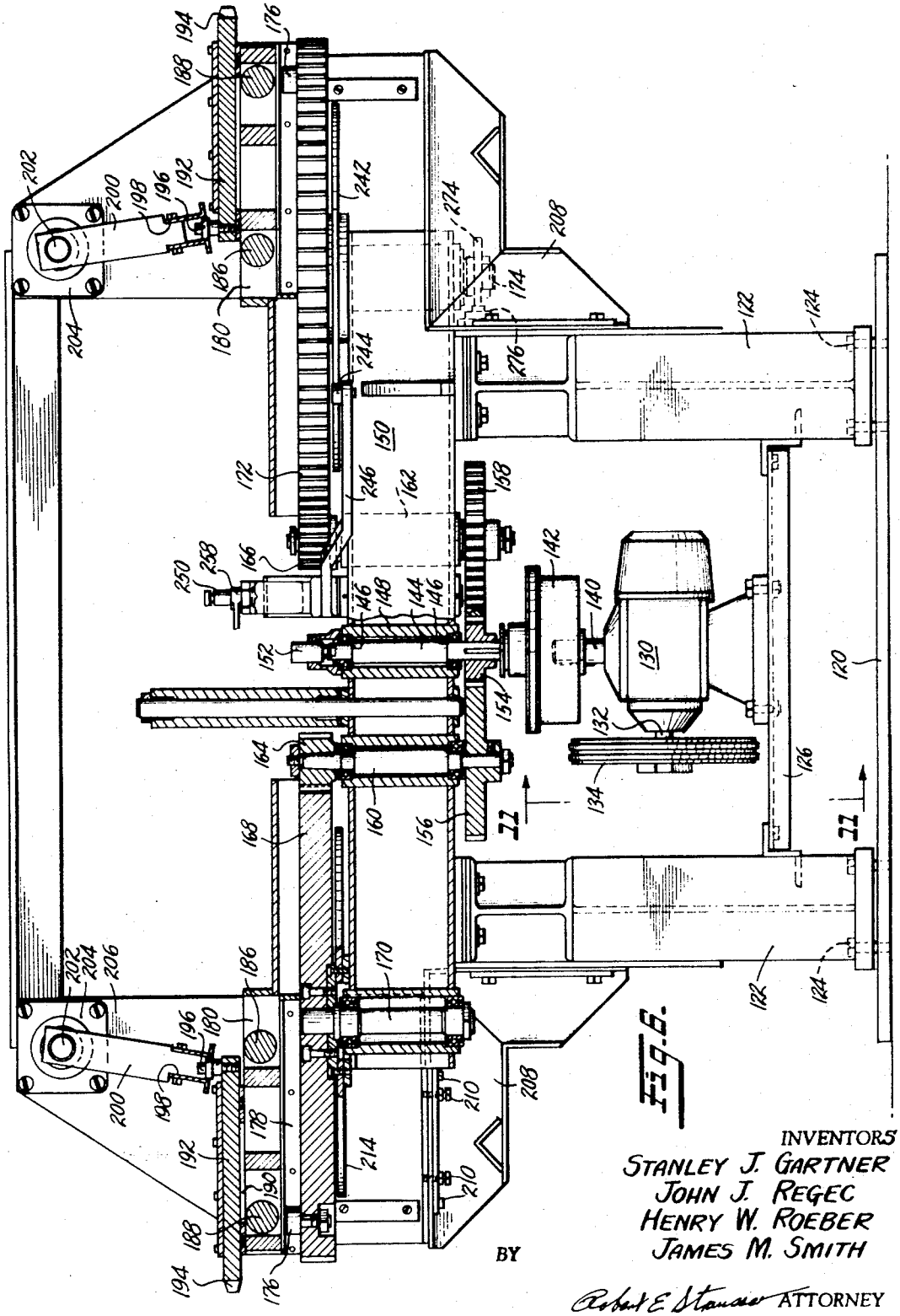


FIG. 6.

INVENTORS
STANLEY J. GARTNER
JOHN J. REGEC
HENRY W. ROEBER
JAMES M. SMITH

BY Robert E. Stauder ATTORNEY

Sept. 9, 1969 S. J. GARTNER ET AL 3,465,867

CHAIN AND INDEXING DRIVING MECHANISM

Filed June 14, 1967 7 Sheets-Sheet 6

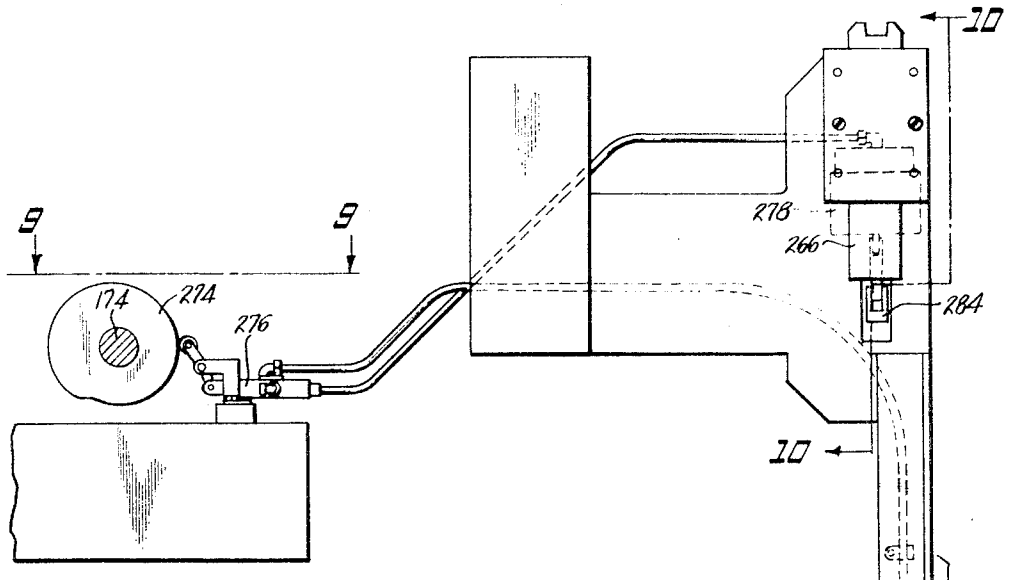


Fig. 8.

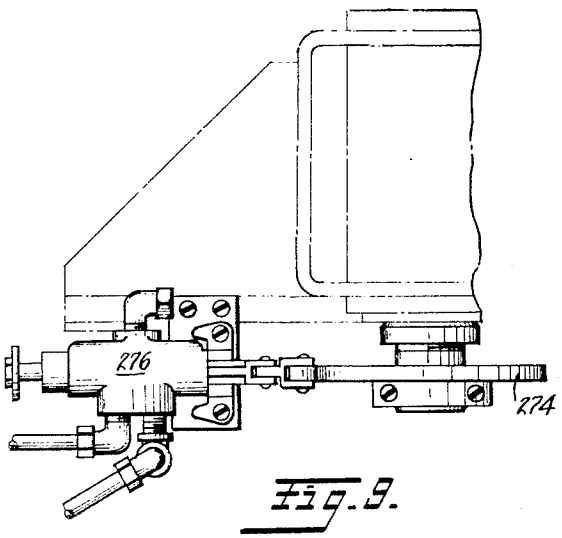
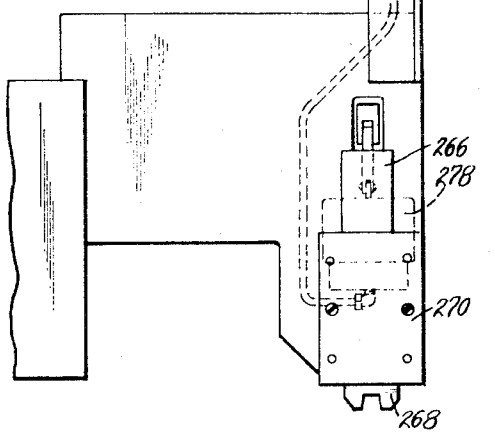


Fig. 9.



INVENTORS
STANLEY J. GARTNER
JOHN J. REGEC
HENRY W. ROEBER
JAMES M. SMITH

BY Robert E. Strauss ATTORNEY

Sept. 9, 1969 S. J. GARTNER ET AL 3,465,867

CHAIN AND INDEXING DRIVING MECHANISM

Filed June 14, 1967 7 Sheets-Sheet 7

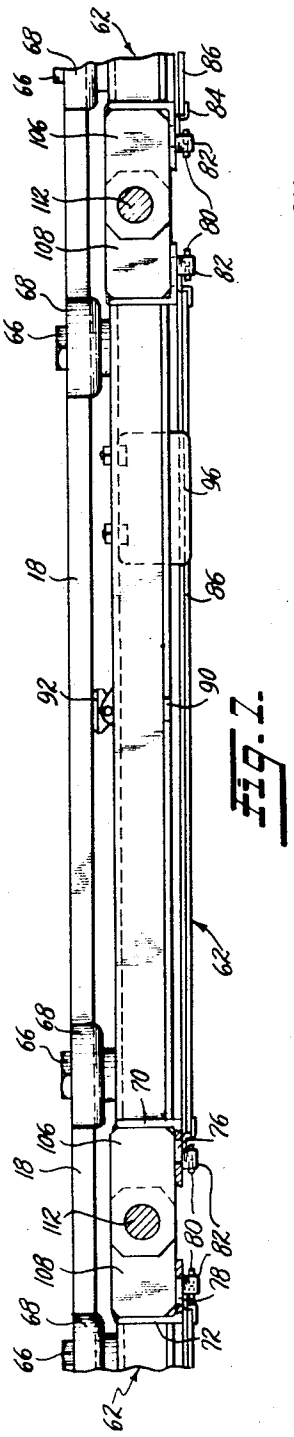


Fig. 7.

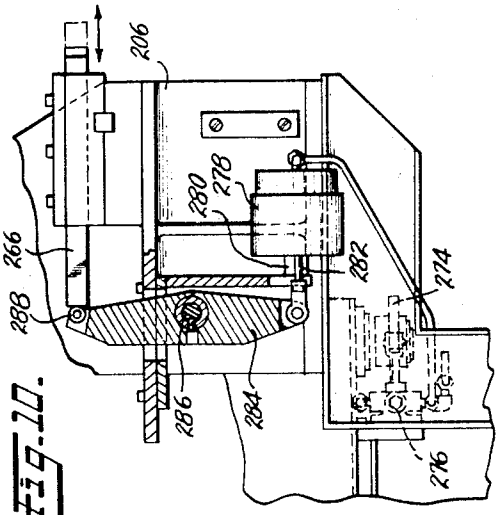


Fig. 10.

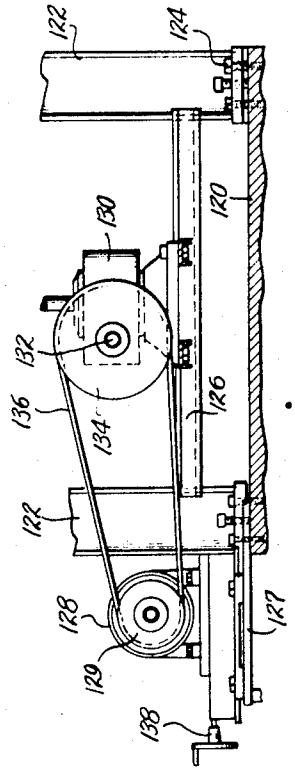


Fig. 11.

INVENTORS
STANLEY J. GARTNER
JOHN J. REGEC
HENRY W. ROEBER
JAMES M. SMITH

BY Robert E. Strauss ATTORNEY

United States Patent Office 3,465,867
Patented Sept. 9, 1969

3,465,867

CHAIN AND INDEXING DRIVING MECHANISM

Stanley J. Gartner, John J. Regec, Henry W. Roeber, and James M. Smith, Emporium, Pa., assignors to Sylvania Electric Products Inc., a corporation of Delaware

Filed June 14, 1967, Ser. No. 646,009
Int. Cl. B65g 17/38
U.S. Cl. 198—19 8 Claims

ABSTRACT OF THE DISCLOSURE

An endless chain of articulated frames is driven intermittently by a drive mechanism operating in a very general sense like the four motion cloth feed bar of a sewing machine. The runs of the chain are in a horizontal plane while the frames themselves are arranged vertically. The frames are at such an elevation as to support carts carried thereby off the floor level, these carts supporting mechanisms to perform various operations on articles, such as cathode ray tubes supported on the carts and while the tubes are transported through processing areas. The carts themselves are detachably hung on the frames and supplied with casters so that when removed from the frames they may be rolled away, as for servicing them.

BACKGROUND OF THE INVENTION

This invention relates to machinery utilized in the processing of cathode ray tubes and particularly to the processing of television picture tubes and is concerned still more particularly with the means for mounting carts carrying the tubes on an endless conveyor of articulated frames and transporting the carts intermittently through work stations. In the prior art these tubes were transported on carts which travelled on the ground or on rails on the ground as in Johnson et al. 2,532,315, De Groat 2,570,103 or Miller et al. 2,785,509. This travel might become impeded by reason of breakage of glassware on the cart falling onto the ground or track, thereby impairing the functioning of the apparatus operative on the picture tube. The motion of the carts was effected by various types of movements. However, the motion of the chains in this invention is by the four motion feed referred to above. It might be of interest to note the feeds in Bayer 1,340,648, Chaplin 2,559,945, Moulin 2,784,599 and Hudson 2,961,879.

BRIEF SUMMARY OF THE INVENTION

It is an object of this invention to overcome the difficulties of the prior art. This is effected by mounting the carts on frames articulated with one another to form an endless carrier. The carts are supported wholly by the frames clear of the floor or any rails thereon.

It is a further object of this invention to provide rugged means to intermittently drive the conveyor of articulated frames. Other objects will become apparent after reading the following specification when taken in conjunction with the accompanying drawings in which:

FIG. 1 is a fragmentary diagrammatic top plan view of the conveyor apparatus used in a machine for exhausting the air from and otherwise processing a picture tube;

FIG. 2 is an enlarged fragmentary side elevational view of the apparatus of FIG. 1 taken substantially on the line 2—2 of FIG. 1;

FIG. 3 is an enlarged fragmentary horizontal sectional view taken on the line 3—3 of FIG. 2;

FIG. 4 is an enlarged fragmentary top plan view of the machine at an indexing station;

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

FIG. 6 is an enlarged fragmentary vertical sectional view taken substantially on the line 6—6 of FIG. 4;

FIG. 7 is an enlarged fragmentary horizontal sectional view taken on the line 7—7 of FIG. 2;

FIG. 8 is an enlarged top plan view of a locking cam and associated locking latches of the indexing mechanism;

FIG. 9 is an enlarged fragmentary elevational view of the locking cam as seen from the line 9—9 of FIG. 8;

FIG. 10 is an enlarged fragmentary end elevational view partly in section, of a locking latch and associated mechanism taken substantially on the line 10—10 of FIG. 8; and

FIG. 11 is a side elevational view on a smaller scale, and partly in section, of the drive mechanism of the indexing mechanism, taken on the line 11—11 of FIG. 6.

CHAIN AND INDEXING MECHANISM THEREFOR

The invention is illustrated as embodied in a machine for processing television picture tubes involving a chain and chain drive, the chain being modified to support carts which in turn support machinery for effecting exhausting of the air from the picture tube and otherwise treating the same, including sealing off the exhaust stem of the picture tube, directly and inductively heating electrodes in the tube and releasing the getter therein.

The cart support chain **10**, FIG. 1, provides an endless series of articulated carriers, the chain having runs parallel to a horizontal plane and riding on a track **18**, FIG. 2, which is elevated above the floor level and which is generally in the form of a long oval with straight parallel reaches **12** and **14** and rounded ends **16**.

The elevated track **18**, see FIGS. 2 and 5, is secured to brackets **20** welded or otherwise secured to vertical I-beams forming posts **22** spaced apart along the whole length of the oval. The lower end of each of the posts is secured to a foot plate **24** fastened to the ground and braced by an inclined prop **26** fixed to the foot plate and to the post. At the upper end of every alternate post there is provided a cross beam **28**, FIG. 1, spanning the space between the reaches of the track and fastened to the post to attain a rigid track supporting structure.

Running parallel to the track **18** and secured to the top of the posts is a chain guideway, FIGS. 2 and 5, in the form of an inverted channel comprised of a top web member **30**, a front plate **32** and an angle iron **34**. The rounded end sections **16** of the track are telescopically associated with the parallel reaches of the track as indicated at **36**, FIG. 1, each of the end sections **16** being supported by a carriage **38** whose wheels ride on a base block **40** beneath the carriage, said base block being fixed to the ground. The support of each of the end sections of the rail is afforded by channel beams **42** or other appropriate means interconnecting portions of the end rail sections and its carriage **38**. To urge each end section of the rail in a direction to extend the chain, each of the end sections is provided with a pair of air cylinders **44** secured to a channel beam **46** fixed on the associated block **40**, the pistons of these cylinders being connected to the carriage **38**. During operation of the machine, air pressure is constantly applied to the cylinders to urge the carriages in directions to maintain the cart supporting chain taut. It is obvious that other means may be employed to maintain the chain taut, as springs interposed between the beam **46** and the carriage.

Below the track **18** and offset inwardly of the oval track is a thrust rail **48**, FIG. 5, whose purpose will be disclosed. This thrust rail is supported from each of the posts by a bracket **50**. Also mounted on each of the posts is a bracket **52** for supporting a trough **54** parallel with the track and rail and suitably supplied with water. The purpose of this trough will also be described later. In addition, each of the supports is provided with a bracket **56** to which an

angle iron 57 is fastened, this angle iron running parallel to the track 18, intermediate the vertical level of the track and thrust rail 48. This angle iron supports insulation blocks 58 to which are fastened three vertically spaced endless contact bars 60 suitably supplied with current, as a conventional 3 phase 60 cycle current for operating 120 and 240 volt equipment on the carts.

The chain itself is composed of a number of identical vertical rectangular frames 62, FIGS. 2 and 7, articulated together, these frames serving as cart supports. Each frame has an upper horizontal channel iron 64 provided at each end with a stub axle 66 supporting a roller 68 riding on the upper edge of the track 18. The other peripheral members of the rectangular frame are composed of angle irons 70, 72 and 74, the left hand and right hand angle irons 70 and 72 each having a slot 76, 78 therein, respectively, the slot 78 in the right hand angle iron 72 being slightly wider than slot 76 in the left hand angle iron 70 to facilitate the hanging onto the frame of a cart with a pair of support lugs each of a width to just fit the width of slot 76. The cart may be hung very easily by first engaging a lug with the wider slot 78 and then adjusting the position of the cart laterally, if needed, to cause the remaining lug to engage slot 76. Also positioned on each of the angle irons 70 and 72, adjacent the bottom thereof is an adjustable stop bolt 80 to be engaged by the lower end of a cart hooked onto the frame as well as a cam wedge 82 to assist the downward sliding movement of and positioning of the cart during the emplacement of the cart on the chain. The bolt may be adjusted to obtain a vertical positioning of the cart. Also located on the uprights 70 and 72 are lugs 84 (FIGS. 2 and 3) for holding a perforated screen 86 in position, which screen is substantially coextensive with the dimensions of a frame. Braces 88 reinforce the frame and a vertical bar 90 is provided, fastened to the irons 64 and 74, this bar supporting on the backside thereof three insulated from each other contact shoes 92 making sliding connection with the three contact bars 60 supported by the posts 22, the shoes being connected by a three wire conductor 94 to a receptacle 96 mounted on the channel bar 64 of the frame. This receptacle is one source of electrical supply for the mechanisms on the cart suspended on the frame. Midway of the length of the lower rail 74 of the frame is a boss 98, FIG. 5, for supporting the stub axle 100 of a roller 102, the stub axle being mounted in place by a lock washer and nut combination 104. This roller rides against the thrust rail 48. The left hand vertical bar 70 of each frame, at its upper end is provided with a pair of spaced ears 106 and 108 and the right hand bar 72 of each frame is provided with an ear 110 interdigitated with the ears 106 and 108. A pin 112 traverses bearings in the interdigitated ears to form a pivotal joint between adjoining frames. The pin extends above the ear 106 and mounted on the upper end of the pin is a pair of independently rotatable rollers 114 riding in the chain guideway composed of the members 30, 32 and 34. The ears 110 and 108 are spaced from each other vertically of the pin 112 to leave exposed a vertical section of pin 112 whereby that section of the pin may be engaged for indexing movement of the chain of frames or for holding the chain of frames in an indexed position.

To effect these chain indexing and holding functions, the following mechanism is provided:

Substantially centrally of the length of the chain conveyor, see FIGS. 4, 6 and 11, and located between the reaches of the chain is a support structure comprising a ground plate 120, FIG. 6, to which is secured a pair of uprights 122, as by screws 124, which may be so threaded that they may be adjusted to secure proper height of the operating mechanism. The fastenings of one of the uprights, see FIG. 11, holds an auxiliary platform 127 in place on which is mounted an electric motor 128 with pulley 129 and on a platform 126 between the posts 122 is a speed reducing gear box 130 having an input shaft 132 with pulley 134 fast thereon connected to the motor by a belt 136, the belt being tightened by conventional means, as by adjusting the crank 138 and shifting the motor in a direction to tighten the belt.

The gearing in gear box 130, FIG. 6, drives a vertical shaft 140, FIG. 6, which is coupled to a driving clutch element within air clutch casing 142, the driven element of said air clutch being coupled to a hollow driven shaft 144 supported in bearings 146 in a tube 148 secured to the upper and lower walls of a rectangular in cross section hollow beam 150 fixed to the top of uprights 122. Timed pulses of air, under pressure, are applied to a nipple 152 journaled in the hollow shaft 144 and therethrough to the movable clutch element within the air clutch casing to intermittently effect coupling of the clutch and drive of the shaft 144. Whenever air is supplied to the clutch, the chain of frames will be indexed one step and then locked in indexed position.

Fixed on the shaft 144 is a spur gear 154 driving two gears 156 and 158. The gears 156 and 158 are mounted on secondary shafts 160 and 162, respectively, journalled in bearings like the bearings 146. To the upper end of secondary shaft 162 is fastened a pinion 166. Pinion 164 drives an index gear 168 fixed to a shaft 170 and pinion 166 drives a lock gear 172 fixed to a shaft 174. Both shafts 170 and 174 are journalled with respect to hollow beam 150 in the same manner as shafts 144, 160 and 162.

Index gear 168 has eccentrically mounted thereon a pin 176 engaging in a slideway 178 on the underside of a carriage 180 having bearings 182, 184, FIG. 4, reciprocatable on fixed rods 186, 188. Therefore, as gear 168 rotates, the carriage 180 will be reciprocated along the rods 186, 188. Above the slideway 178 and fixed to the carriage is a second slideway 190 in which is reciprocatable an indexng slide 182 integral with a forked index latch finger 194, adapted when projected from the slideway to engage about a pivot pin 112 in the space between the ears 108 and 110 to effect the engagement necessarily incident to the indexing movement of the chain of frames. To effect shift of the slide, the rear thereof is provided with a roller 196 engageable in a slideway 198 of a swingable frame 200 fixedly secured to a shaft 202 journalled in bearings 204 at the upper end of extensions 206 from brackets 208 attached to the uprights 122, which extensions may be adjusted in height by manipulation of adjusting screws 210. The rods 186, 188 also are supported by the same extensions 206.

The carriage 180 and its associated elements as well as the swinging frame 200 and its associated elements are duplicated for each of the two reaches of the chain of frames and the drive mechanism is so arranged that when index latch finger 194 is driving one reach of the chain of frames in one direction by reason of reciprocation of carriage 180 in one direction, the opposite corresponding latch finger is moving the other reach of the chain in the opposite direction so that both fingers 194 move the whole chain of frames in one direction.

To effect coincident movement of both carriages 180, the index gear 168 is provided with a cam 214 on the underside of the gear, said cam cooperating with a cam follower 216, FIG. 4, on the end of an arm 218 integral with a lever 220 pivoted intermediate its ends, as on a stub shaft 222 fixed on the hollow beam 150. Stretched between a pin 224 on one end of the lever and a pin 226 projecting from extension 206 is a link arrangement including a spring 228 to maintain the follower 216 against cam 214. Adjacent the pin 224 on the lever 220 is a second pin 230 connected by a link 232 to a side member of the swingable frame 200 at a point below its axis of rotation, to oscillate the frame when the lever is oscillated. The opposite frame 200, at the lower portion of FIG. 4, is connected to the opposite end of lever 220 by a telescopic link 234. The link is urged to its extended position by a spring 236 between sections of the link and the link itself is connected between a pivot 238 on the frame

200 below the shaft 202 and a pivot 240 on the end of lever 220. The telescopic spring link is provided to ensure simultaneous engagement of both index fingers without too much fine adjustment of the length of the links 232 and 234. The cam 214 will cause the fingers 194 to be in projected position when the carriages are being reciprocated in one direction of reciprocation and to be in retracted position during its other direction of motion, the motion of the carriage and its finger being much like that of a sewing machine cloth feed or four way motion.

Between indexing movements of the conveyor, it is held against displacement by a set of locking fingers, one for each reach of the chain. The mechanism involved for effecting the action of the locking fingers is as follows:

Below the lock gear 172 and fastened to it is a lock cam 242. Cooperating with this lock cam is a cam follower 244 on the end of an arm 246 integral with a lever arm 248 pivoted on a stub shaft 250 mounted on the beam 150. Close to the end of the arm 248 is a pin 252 and stretched between this pin and a pin 254 fixed in extension 206 is a spring 256 tending to maintain cam follower 244 against its cam. The outer end of lever 248 is connected by a link 258 to the arm of a lever 260 pivoted on a fixed pivot 262 on an extension from a cross brace 263 interconnecting the brackets 206, a second arm of the lever being connected by a pitman 264 to a lock slide 266 having a forked finger 268 to embrace a pin 112 in one reach of the chain of frames when the finger is projected from a slideway 270 fixed to the extension 206. A link 272 connected to the first arm of lever 260 is connected to a companion lock slide operative on the opposite reach of the chain of frames. The coordination of index cam 214 and lock cam 242 is such that when the index fingers are advancing the chain of frames, the lock fingers are out of engagement with the chain. Just as the indexing stops and while the index fingers are being withdrawn from the pins engaged by them, the lock fingers are brought to embracing engagement of ensuing pins 112 to lock the chain against movement until the index fingers are again projected to embrace the pins 112 next adjacent the pins 112 engaged by the lock fingers. Since the lock fingers work under the force applied thereto by the link 258, to make doubly sure that the index fingers are in locking position when they should be, a second, lock control cam 274, FIGS. 8 and 9, is provided coaxial with cam 242 on the lower end of shaft 174, this cam controlling a valve 276 controlling the fluid of compressed air to adjacent air motor 278 and the corresponding motor 278 adjacent the other reach of the chain. Each motor (FIG. 10) has its cylinder fixed to an extension 206 as through the intermediary of bosses 280. The piston rod 282 of each motor is connected to the lower end of a lever 284 pivoted at 286 to extension 206, the upper end of lever 284 being provided with a roller 288 to press against the rear end of slide 266 when locking of the chain against movement is required.

In order to brace the upper end of pivot shaft 222, FIG. 4, a brace block 290 is provided in which the shaft 222 rotates and two brace links 292 are provided interconnecting the brace block with the extensions 206.

As the chain indexes, the frames carry with them the carts, suspended from the frames and free of contact with the floor. One of these carts is shown at 300 in FIG. 5. It comprises a framework having a bottom plate 302 on which may be bolted various kinds of machinery utilized in the processing of a picture tube such as the picture tube 304 shown as supported by an upstanding framework 306 and coupled by a suction port coupling 308 to exhaust mehcanism in the cart. Though not shown, a bombarding coil is also mounted on the cart which, when the cart is loaded with a picture tube, is hand shifted to an appropriate position about the neck of the tube so that when the coil is energized, picture tube processing is facilitated. The machinery in the cart may comprise a number of air exhausting pumps such as is well known in the art and a water cooling arrangement for at least one of the exhaust pumps involving a water pump having inlet pipe 310 and outlet pipe 312, both pipes being submerged in the water in trough 54. In addition, various trip arms, as bell crank levers 314 and 316, are located on the cart to be engaged (see FIG. 1) by pins 318 on posts 320 which posts may be arranged in a path traversed by the arms 314 and 316 as the chain indexes. When engaged by the pins, the bell cranks 314 and 316 will be oscillated to close or open certain circuits for processing the picture tube in accordance with processing program selected. Also spring pressed shoes, such as 322, are provided on the carts to engage electric conductors 324 supported by the posts to conduct current to certain pieces of machinery in the carts, the conductors being of a length and positioned in accordance with the selected program. Also conductor 325 on the cart plugged into receptacle 96 will provide for additional current supply to machinery on each cart.

Since the machinery on the cart is not part of this invention, no detailed description thereof appears to be necessary. Reference is again made to detailed disclosure of the machinery in the carts as, for example, is disclosed in Miller et al. 2,785,509 or Johnson et al. 2,532,315 for further enlightenment in this regard.

The cart is provided with rollers or casters 326 to enable rolling of the cart when dismounted from the conveyor and resting on the floor. The cart also has two inverted L-shaped hooks 328 of equal size adapted to engage in the slots 76 and 78 of angle irons 70 and 72. In actual practice of the invention, there is provided close to the loading station, FIG. 1, a pair of floor embedded elevators, as at locations 330 and 332, the one at location 330 being operated to engage beneath and initially lift a cart to lift the hooks on the carts out of engagement with the lower edge of slots in the frames, the cart when being rolled slightly away from the chain conveyor so as to completely disengage the hooks from the slots, prior to lowering the elevator and sinking of the elevator so the top thereof is flush with the floor. The elevator at location 332 is operated to lift a cart rolled onto the elevator to coupling level with the chain conveyor, the cart then being pushed forward to cause hook entrance into the slots in the frames whereupon the second elevator is lowered, to allow the hooks to lower in the slots and couple the carts to the frames.

We claim:

1. A conveyor comprising in combination:
a base having upstanding posts;
a trackway affixed to and supported by said posts, said trackway including an endless upper track and an endless thrust rail, said track and thrust rail being in planes parallel to said base, horizontally displaced from one another, and vertically spaced from one another and from said base;
an endless chain of frames articulated to one another and affixed to and supported by said trackway, each of said frames including means for riding on said upper track to effect support therefor against downward gravitational movement, means on one face near the lower portion thereof for contacting said lower thrust rail to effect support of said frame against swinging motion in at least one direction, and means including slotted frame members for supporting an object on the other face of said frame in a cantilever fashion; and
carts having lugs thereon and extending laterally therefrom, said lugs being adapted for engagement with said slotted frame member.

2. The combination as set forth in claim 1 including means for intermittently advancing said endless chain of frames.

3. The combination set forth in claim 2 including a pin for effecting articulation of adjacent frames and said

means for intermittently advancing said endless chain of frames includes an element adapted to engage said pin.

4. The combination of claim 1 wherein said means for supporting an object on the other face of said frame includes a slot in each of two lateral side members of said frame.

5. The combination of claim 4 wherein the slots in the two lateral side members of said frame are of different widths.

6. The combination of claim 4 wherein said carts have a pair of lugs thereon extending laterally therefrom, said slots being adapted for engagement by said lugs of said carts.

7. The combination of claim 6 wherein the slots in each of the two lateral side members of said frame are of different widths with one of said slots formed to snugly engage one of said pair of lugs of said cart and the other of said slots being wider to provide free engagement of the other of said pair of lugs of said cart.

8. The combination of claim 6 wherein said carts are

detachably suspended above said base by engagement of said lugs of said cart and said slots of said frame; each of said carts including a motor therein; each of said frames including a contact shoe readily detachable electrically from said motor, and an electrical contact bar supported by said posts in parallel relationship to said track and rail and in cooperating relationship with said contact slots.

References Cited

UNITED STATES PATENTS

1,431,536	10/1922	Maloney	104—119
1,477,494	12/1923	Hutchison	104—119
2,311,640	2/1943	Cornell	198—181
2,990,940	7/1961	Merchant	198—181

RICHARD E. AEGERTER, Primary Examiner

U.S. Cl. X.R.

198—135