United States Patent

[11] 3,613,869

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[23] **Division of Ser. No. 796,392, Feb. 4, 1969, abandoned**
[45] Patented **Oct. 19, 1971**

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[54] **MECHANISM FOR CYCLICALLY MOVING A PARTS ACCUMULATOR-CONVEYOR**
10 Claims, 17 Drawing Figs.

[52] **U.S. Cl.** **198/220**

[51] **Int. Cl.** **B65g 27/02**
[50] **Field of Search** 198/220
BC, 220 DA, 219; 74/23

[56] **References Cited**

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Primary Examiner—Edward A. Sroka
Attorney—Cullen, Settle, Sloman & Cantor

ABSTRACT: A mechanism for cyclically raising, oscillating and lowering a vertically arranged drumlike parts conveyor of the type having a spiral wound shuttle track for moving parts incrementally along an adjacent fixed spiral wound track upon which a large number of workpieces or parts are supported.

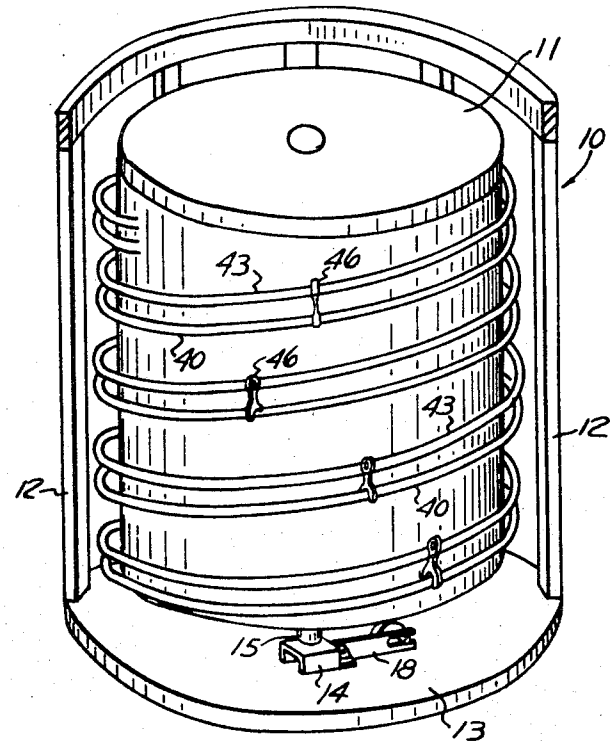


FIG. 1

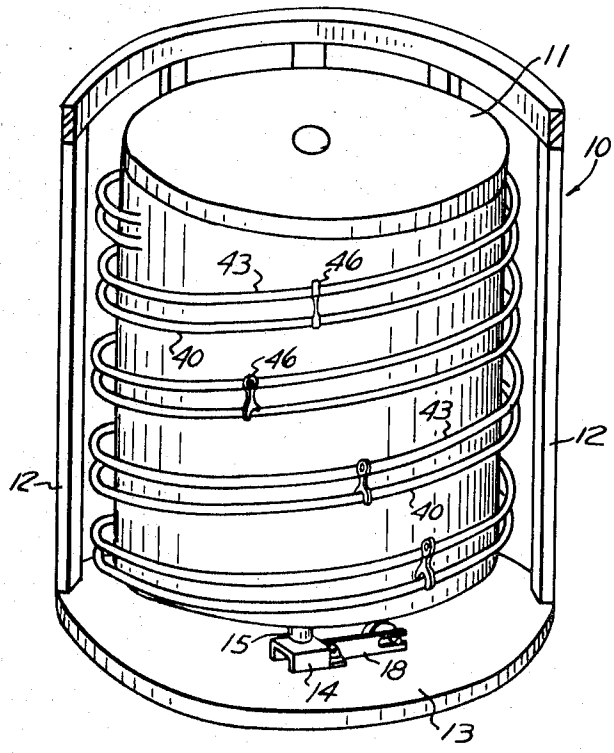


FIG. 2

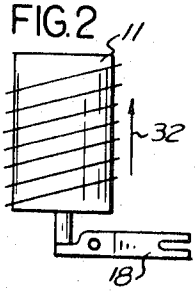
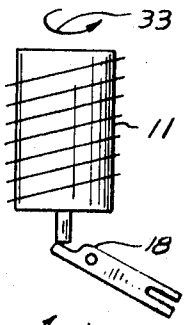


FIG. 3



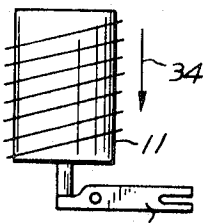


FIG. 4

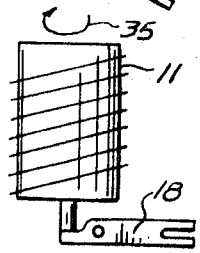
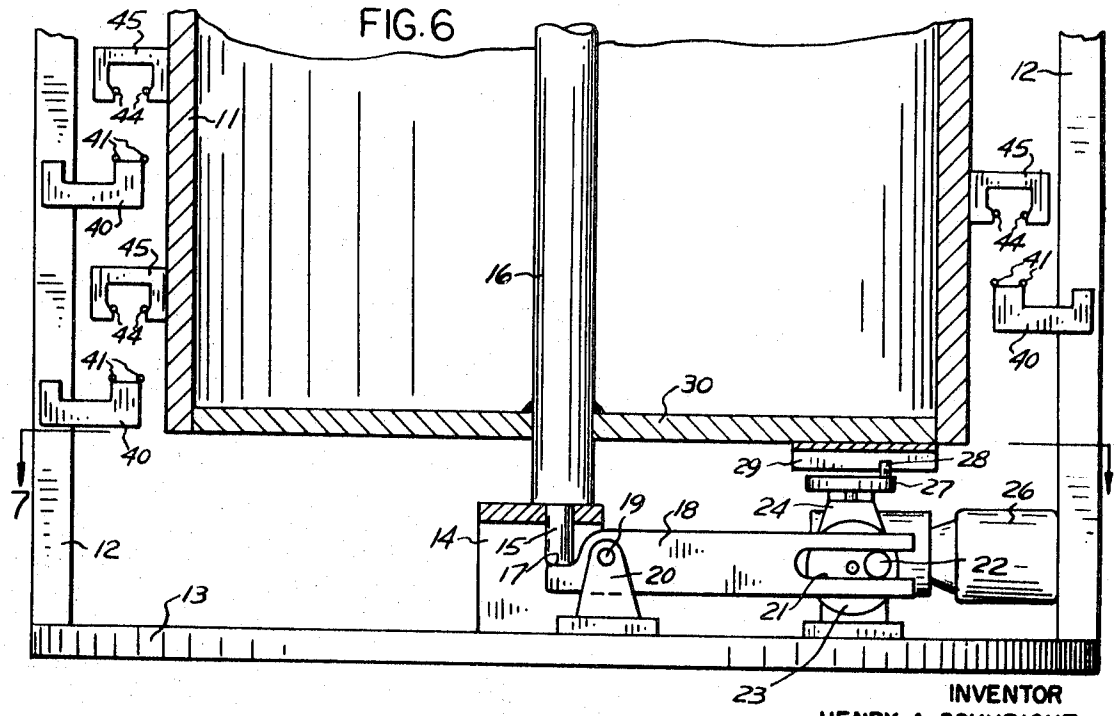


FIG. 5

FIG. 6



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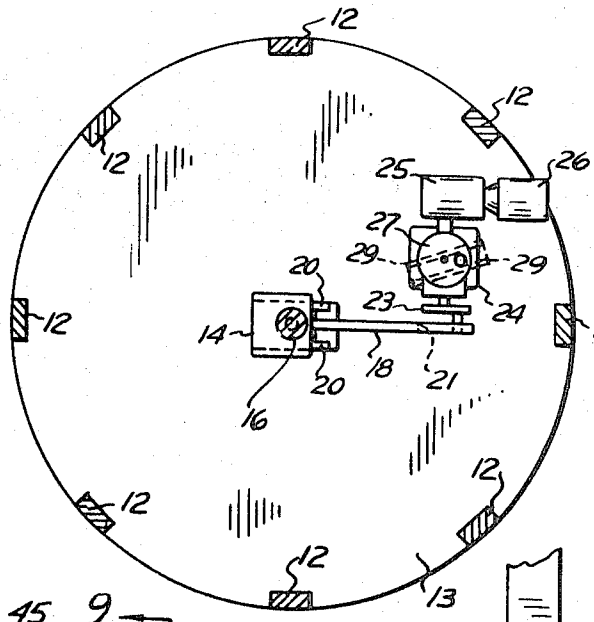


FIG. 7

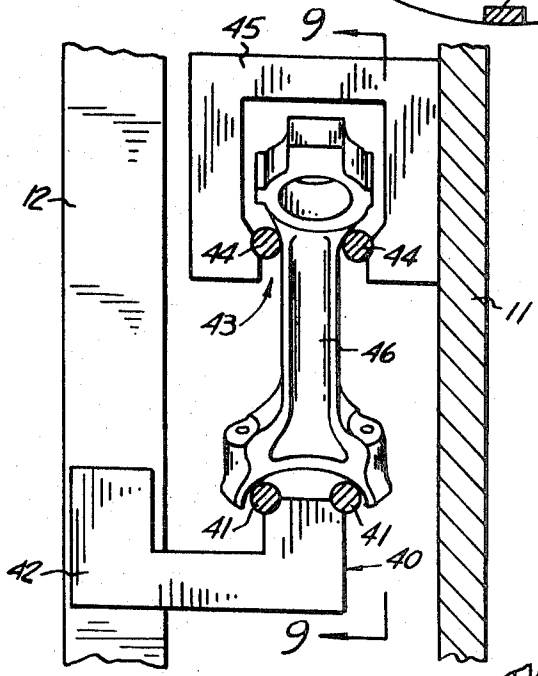


FIG. 8

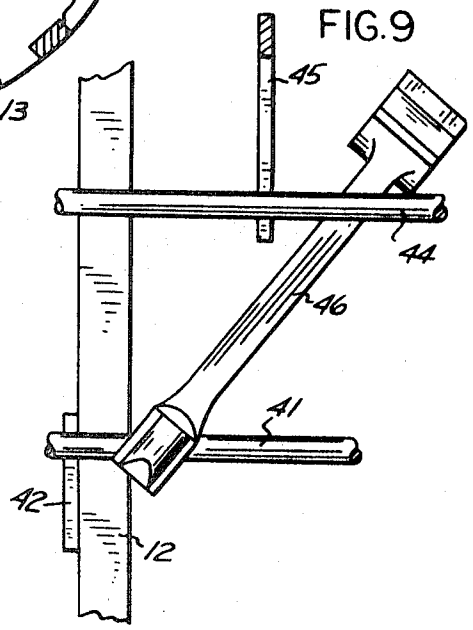


FIG. 9

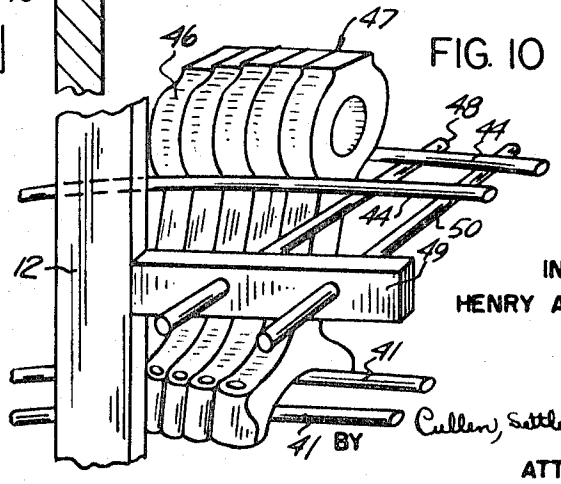


FIG. 10

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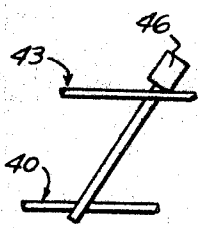


FIG. 11

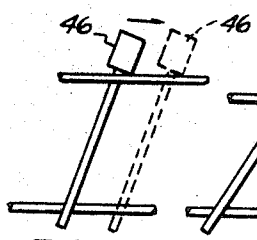


FIG. 12

FIG. 13

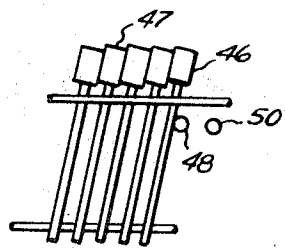


FIG. 14

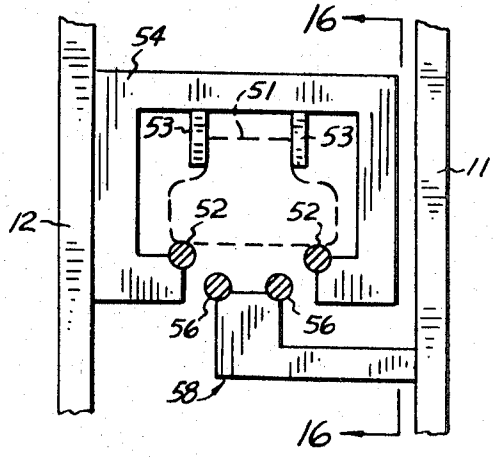


FIG. 15

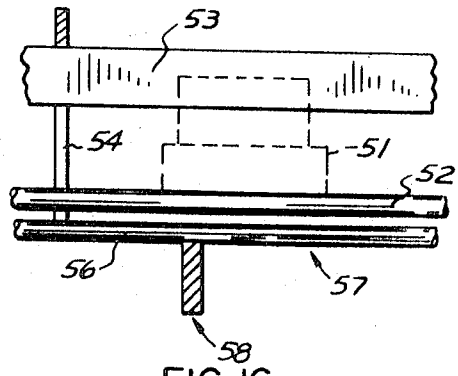


FIG. 16

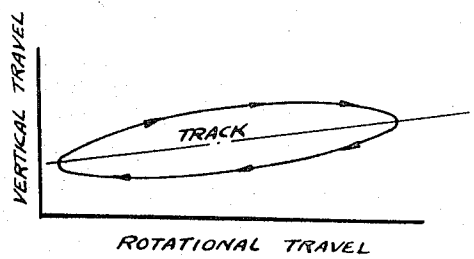


FIG. 17

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MECHANISM FOR CYCLICALLY MOVING A PARTS ACCUMULATOR-CONVEYOR

PARENT APPLICATION

This application is a divisional of my earlier application, Ser. No. 796,392 filed Feb. 4, 1969, **now abandoned.**

BACKGROUND OF THE INVENTION

Part accumulator-conveyors are used in assembly lines for storing and slowly moving the pats received from one machine or operation area before entering into the next stage of processing of the part. Thus, parts are accumulated after one operation to form a backlog for the next.

Various types of conveyors and containers have been used for part accumulation. One prior type consisted of a gravity operated unit having spiral tracks formed of stiff wires or aligned rollers upon which the parts were loaded for gravity moving from the upper end to the lower end of the tracks. This unit required an elevating and loading means for initially positioning the parts upon the upper end of the tracks. After reaching the lower end of the tracks, the parts frequently had to be raised again to enter the next operation.

In addition, in this sort of accumulator, the movement of and contact between the parts frequently caused damage to both the parts and the equipment.

Thus, the invention herein relates to a spiral track type of parts accumulator but wherein the parts are moved up the track, rather than downwardly as in the past, and portions of the supporting tracks have been power cycled to positively move the parts. More specifically, the invention of this application is concerned with a mechanism for moving the track cyclically as described above.

SUMMARY OF INVENTION

The invention herein contemplates a mechanism for cyclically moving, i.e., upwardly, back and forth oscillation, and downwardly a central cylinder or drum which carries a spiral track which functions as a shuttle or carrier or conveyor means due to the repeated cyclical movement of the drum. Surrounding the drum is another outer cylinder or cylindrical framework carrying a fixed track upon which a large number of parts may be supported. he shuttle track incrementally moves the parts up the spiral until the parts are bunched at the top for removal one by one.

Other objects and advantages of this invention will become apparent upon reading the following description, of which the attached drawings form a part.

DESCRIPTION OF DRAWINGS

FIG. **1** is a perspective view, partly cut away, showing the part accumulator and transporter herein.

FIG. **2** is a schematic view of the inner drum showing the first step in its movement, namely, in an upward direction, and

FIGS. **3**, **4** and **5** show the succeeding three steps in the cycle of movement of the inner drum.

FIG. **6** is an enlarged, elevational view, partly in cross section, of the lower portion of the apparatus, and

FIG. **7** is a cross-sectional view taken in the direction of arrows **7—7** of FIG. **6**.

FIG. **8** is an enlarged, fragmentary view showing the tracks supporting a part, and

FIG. **9** is a view taken along arrows **9—9** in FIG. **8**.

FIG. **10** is a perspective view showing the parts arranged in a bunch at the discharge end of the tracks.

FIGS. **11**, **12**, **13** and **14** are schematic views showing the sequence of movement of a part.

FIG. **15** is an elevational view showing a modified form of track, and

FIG. **16** is a cross-sectional view taken in the direction of arrows **16—16** of FIG. **15**.

FIG. **17** graphically shows the path of track movement.

DETAILED DESCRIPTION

The parts accumulator and transporter, generally designated **10**, comprises an inner vertically arranged cylinder or drum **11**, surrounded by an outer cylinder **12** having a support base **13**. The inner drum, while shown as being of a tubular or sheet form, may actually be formed of a framework of vertical bars and internal supporting ribs. The outer cylinder is illustrated as being formed of a framework of bars and it too may be formed here of a framework or a solid sheet material.

Referring to FIGS. **6** and **7**, a support bracket **14** secured to the base **13**, rotatably receives the lower end **15** of a shaft **16** upon which the inner drum **11** is mounted. The lower end **15** of the shaft **16** in turn is rested upon the end **17** of a crank **18** pivotally connected at **19** to a support bracket **20**.

The opposite end of the crank is formed as a split or bifurcated end **21** receiving a stud **22** secured upon a cam disk **23** which is rotated in a vertical plane by means of connection through a transmission **24**, a gear box **25**, to a motor **26**. Thus, rotation of the cam **23** causes the crank **18** to move upwardly and downwardly, in turn moving the entire inner drum upwardly and downwardly.

Also secured to the transmission **24** is a horizontally arranged cam disk **27** having a stud **28** engaging between guides **29** secured to the baseplate **30** of the inner drum **11**. Rotation of the horizontal cam disk **27** thereby causes back and forth rotative movement of the drum through a small arc of a circle, as for example roughly 15°.

FIGS. **2–5** show the four steps in the movement of the drum, namely, an upstroke as illustrated by arrow **32** in FIG. **2**, the forward rotative stroke illustrated by arrow **32** in FIG. **2**, the forward rotative stroke illustrated by arrow **33** in FIG. **3**, the downstroke illustrated by arrow **34** in FIG. **4** and the return rotative stroke illustrated by arrow **35** in FIG. **5**. See FIG. **17**, for the path of movement of the track.

Referring to FIGS. **8** and **9**, secured to but spaced within the outer cylinder is a spiral fixed track **40**, preferably formed of a pair of spaced apart stiff wires or rods **41**, each secured to a bracket **42** in turn secured to the adjacent area of the outer cylinder **12**. The fixed track, starting at the bottom of the cylinder spirals around the cylinder and terminates near the top of the cylinder.

Arranged in vertical alignment with, but spaced from the fixed track, is a shuttle or movable track **43**, likewise preferably formed of stiff wires **44** or similar rod material, secured to spaced brackets **45** in turn fastened to the inner drum **11**. Thus, the shuttle or movable track **43** moves with and in accordance with the movement of the inner drum.

The spacing between the wires forming each of the two tracks, as well as the spacing between the tracks, will depend upon the size and shape of the part being moved. The drawings show a part **46** in the form of an engine connecting rod which has been one of the most difficult types of parts to accumulate and move because of its odd shape, being long and narrow, with bowed upper and lower ends.

As illustrated in FIGS. **8** and **9**, the connecting rod **46** is rested upon the fixed, lower track and its upper end is suspended between the two wires **44** making up the shuttle track, with the rod being arranged at an angle to the vertical.

OPERATION

In operation, the parts, such as the connecting rods **46**, are placed one by one upon the lower end of the tracks and they are incrementally moved upwardly until they form a bunch of parts **47** at the upper or discharge end of the track. The movement of the parts is illustrated in FIGS. **11–14**, as follows:

In FIG. **11**, the part **46** is supported by the fixed track **40**, with its upper end suspended from and also somewhat supported by the shuttle track **43**. At this point, the cylinder raises upwardly as shown in FIG. **2**, so that the part is tilted more to the vertical (see FIG. **12**) and at that point the short rotation of the drum causes the shuttle track to move or drag the part along the lower track a short distance as illustrated in dotted lines in FIG. **12**. Next, the drum is depressed (see FIG. **4**)

lowering the part back into the position shown in FIG. 13, at which point the return rotation of the drum causes the shuttle track to simply slip relative to the workpiece and return to its initial starting position. With this regular, cyclical movement of the shuttle track, the part is incrementally moved along the length of the track until it reaches the bunched parts 47. At this point, the parts tend to become more nearly vertical due to contact with each other and as a result the bunch of parts avoid contact altogether, with the shuttle track, thereby avoiding wear and abrasion upon the shuttle track as well as upon the parts.

The bunch of parts is maintained at the end of the trak by means of a suitable stop rod 48 which passes through the space bewteen the tracks and cathes the parts. Although various forms of holding and locking mechanisms may be used, for illustration purposes, the rod 48 is shown as extending through an opening in a bracket 49 secured to the outer drum 12, which bracket also contains a release rod 50 so that upon release of the stop rod 48, one part advances into contact with the release rod 50 at which point the stop rod 48 is replaced, the release rod 50 released and the part then drops out of the track into a suitable chute or conveyor for carrying it to the next location. With this stop means, a predetermined number of parts can be released.

The release mechanism is not part of the invention herein and may be varied to suit the need, such as the rate or release, the size and shape of parts, etc.

MODIFICATION

FIGS. 15 and 16 show s modified form of track better suited for handling wide, heavy, squat parts 51. Here, the part is rested upon the parallel wires 52 forming the fixed track, but is also guided by a pair of guide tracks 53 located above the fixed track. The guide tracks and the support wires are secured to spaced apart brackets 54, secured in turn to the outer cylinder.

The shuttle track 55, here located slightly below the fixed track is formed of a pair of parallel stiff wires 56 connected by brackets 58 to the inner drum 11.

With this arrangement, the shuttle track rises, during the start of the cycle, until it engages the bottom surface of the part 51 and moves it a short distance along the fixed track. The graph illustrated in FIG. 17 shows the track movement.

Having fully described an operative embodiment of this invention, I now claim:

1. A mechanism for continuously cyclically raising, oscillating, generally horizontally back and forth, and lowering a parts conveyor means mounted upon a vertical support shaft, comprising:

an elongated lever arm mounted near one of its ends upon a horizontal axis located beneath said conveyor means, with the end of the shorter portion of the arm engaging the lower end of said shaft, and with the end of longer portion of the arm being engaged with a continuously moving cam means for regularly rocking the arm upwardly and downwardly about said axis, thereby regularly raising and lowering said shaft and its conveyor means; and a horizontally rotating cam means, mounted

upon a fixed vertical axis beneath said conveyor means, and operatively connected with the conveyor means for regularly oscillating it back and forth a short angular distance in a horizontal direction, moving it first in one direction when the shaft is raised and in the opposite direction when the shaft is lowered.

2. A mechanism as defined in claim 1, and wherein said continuously moving cam means is in the form of a stud mounted upon the face of a horizontally axised rotating plate, said stud being fitted within a slot formed in the long portion of the arm at the end thereof and extending in a lengthwise direction of the arm.

3. A mechanism as defined in claim 1, and said horizontally rotating cam means comprising a vertically arranged stud mounted upon a vertically axised rotating plate, with said stud being fitted within a horizontally slotted element connected to said conveyor means for oscillating said element in a horizontal plane.

4. A mechanism as defined in claim 1, and said continuously moving cam means being in the form of a stud mounted upon the face of a horizontally axised rotating plate, said stud being fitted within a slot formed within the long portion of the arm near the end thereof, and extending in a lengthwise direction of the arm;

and said horizontally rotating cam comprising a vertically arrange stud mounted upon a vertically axised rotating plate, with said vertically axised stud being fitted within a horizontally slotted element operatively connected to said conveyor means for oscillating said element in a horizontal plane.

5. A mechanism as defined in claim 4, and including a motor connected to both of sid cam means for simultaneously driving said cam in timed relationship with each other.

6. In a parts accumulator-conveyor, comprising a set of sloped, fixed tracks upon which a plurality of identical T-shaped parts are supported, with the lower ends of their shanks resting upon the fixed tracks; and a set of movable tracks above and outside of the space between the fixed tracks and in vertical alignment with and beneath the heads of the parts; and means for cyclically moving the movable tracks slightly upwardly, then forwardly horizontally a short distance, then downwardly, then return horizontally, to thereby repeatedly and continuously move the movable tracks correspondingly, with the movable tracks engaging the undersides of the heads of the parts of the upstroke and lifting them slightly relative to the fixed tracks and moving the parts along the fixed tracks on the forward stroke, then dropping them back upon the fixed track upon the downstroke and returning to the original position to repeat the cycle thereby moving the parts incrementally along the fixed tracks, the improvement comprising:

said means for cyclically moving the movable tracks comporising a vertical shaft upon which movable tracks are mounted;

an elongated arm mounted near one of its ends upon a horizontal axis located beneath said movable tracks, with the end of the shorter portion of the arm engaging the lower end of said shaft, and with the end of the longer portion of the arm being engaged with a continuously moving cam means for regularly rocking the arm upwardly and downwardly about said axis, thereby regularly raising and lowering said shaft and the movable tracks;

and a horizontally rotating cam means, mounted upon a fixed vertical axis beneath said movable tracks, and operatively connected with the movable tracks for regularly oscillating them back and forth a short angular distance in the horizontal direction.

7. A construction as defined in claim 6, and wherein said continuously moving cam means is in the form of a stud extending horizontally from the face of a horizontally axised rotating plate, with said stud being fitted within a slot formed within the long poportion of the arm at the end thereof and extending in a lengthwise direction of the arm.

8. In a parts accumulator-conveyor comprising a set of slopped fixed tracks upon which a plurality of identical parts are supported; and a set of movable tracks, vertically spaced from, but parallel to the fixed tracks and in vertical alignment and beneath at least a portion of each of the parts, and said movable tracks being secured to a movable support, and means for cyclically moving the support slightly upwardly, then forwardly horizontally a short distance, then downwardly, then return horizontally, to thereby repeatedly and continuously move the movable tracks correspondingly; with the movable tracks engaging the parts on its upstroke and lifting them slightly relative to the fixed tracks, and moving the parts along the fixed tracks on its forward stroke, the dropping them back upon the fixed track with its downstroke and

returning to its original position to repeat the cycle to thereby incrementally move the parts along the fixed tracks, the improvement comprising:

said means for cyclically moving the support comprising an enlongated arm mounted near one of its ends upon a horizontal axis located beneath said support, with the end of the shorter portion of the arm engaging the lower end of said support and with the end of the longer portion of the arm being engaged with a continuously moving cam means for regularly rocking the arm upwardly and downwardly about said axis thereby regularly raising and lowering sid support;

and a horizontally rotating cam means mounted upon a fixed vertical axis beneath sald support and operatively connected with the support for regularly oscillating it back and forth a short angular distance in the horizontal direction, moving it first in one direction when the support is raised and in the opposite direction when the support is lowered.

9. A construction as defined in claim **8** and wherein said continuously moving cam means is in the form of a horizontal stud mounted upon a vertically arranged rotating plate, said stud being fitted within a slot formed in the long portion of the arm at the end thereof and extending in the lengthwise direction of the arm.

10. A construction as defined in claim **9**, and said horizontally rotating cam means comprising a vertically arranged portion mounted upon a vertically axised rotating plate, with said portion being fitted within a horizontally slotted element connected to said support means for oscillating said element and support in a horizontal plane.