Dec. 26, 1939. D. E. GRAY 2,184,915

CONYEYER

Filed June 8, 1937 3 Sheets-Sheet 1

Fig. 1

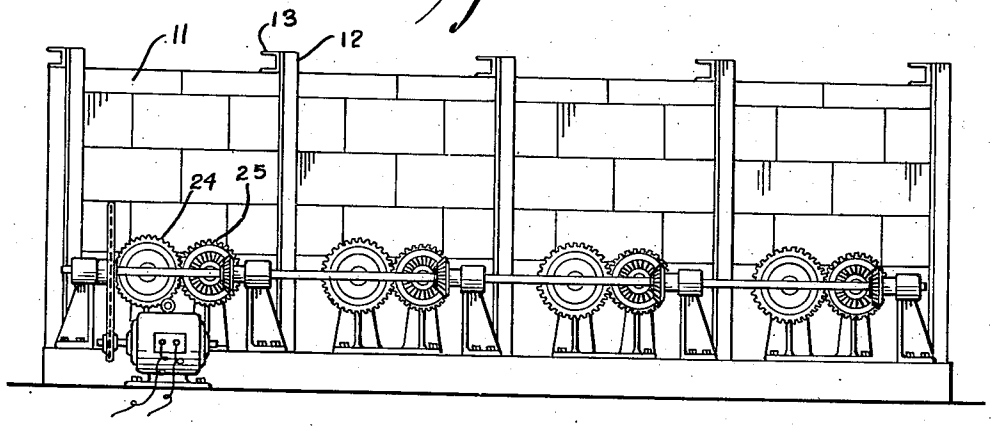
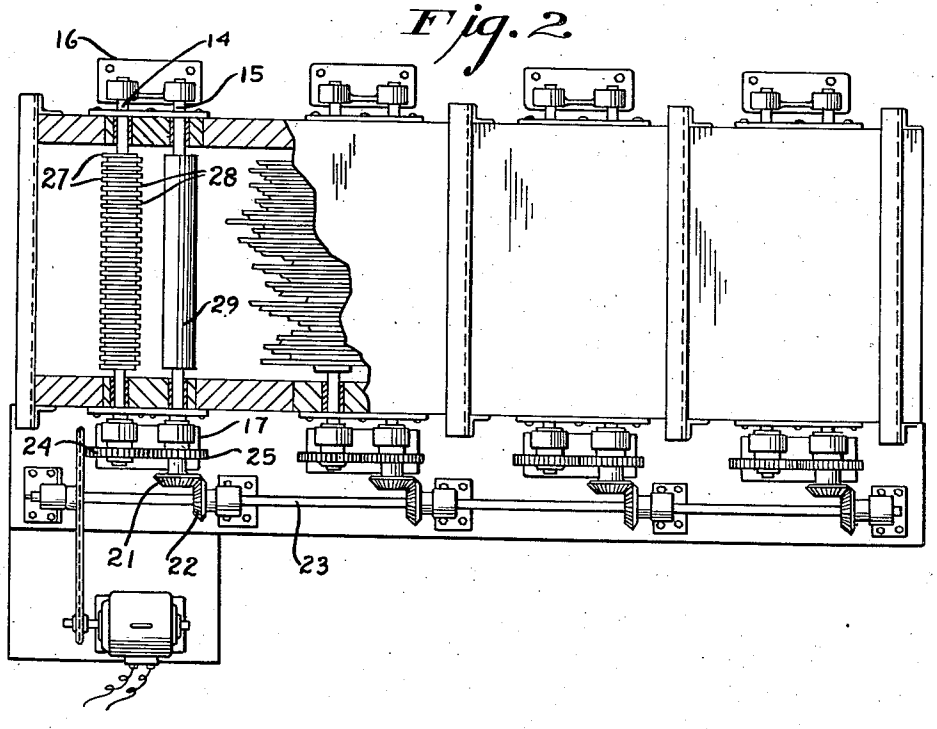


Fig. 2



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Filed June 8, 1937 3 Sheets-Sheet 2

Fig. 3

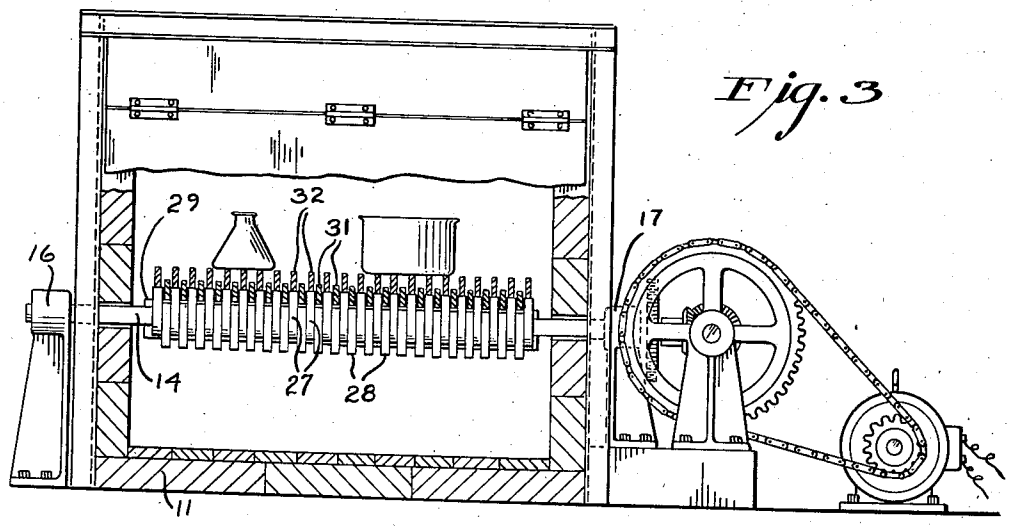


Fig. 4

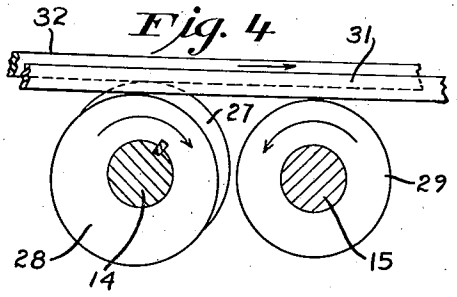


Fig. 5

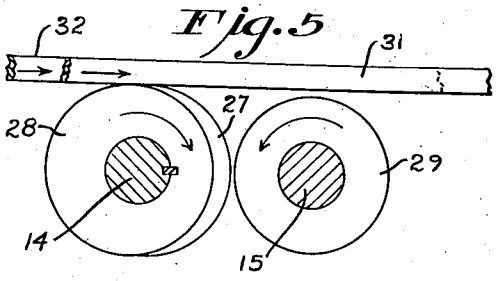


Fig. 6

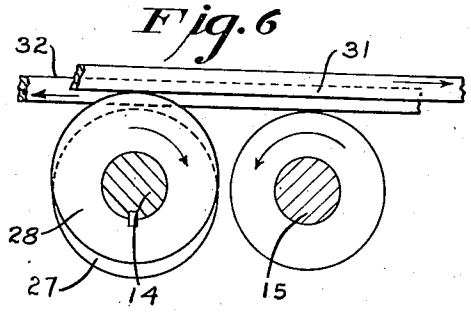
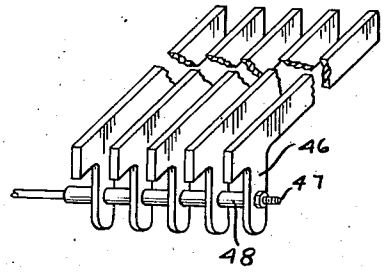


Fig. 7



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Dec. 26, 1939. D. E. GRAY 2,184,915

CONVEYER

Filed June 8, 1937 3 Sheets-Sheet 3

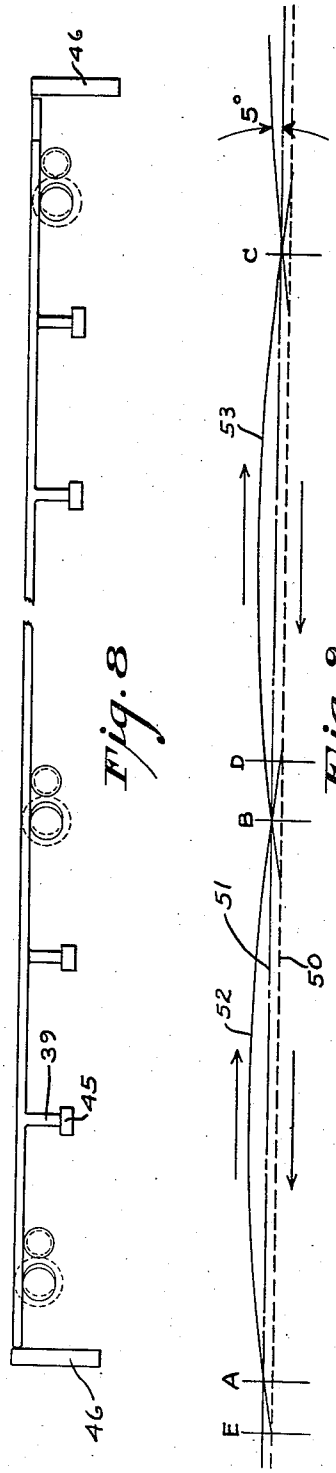


Fig. 8

Fig. 9

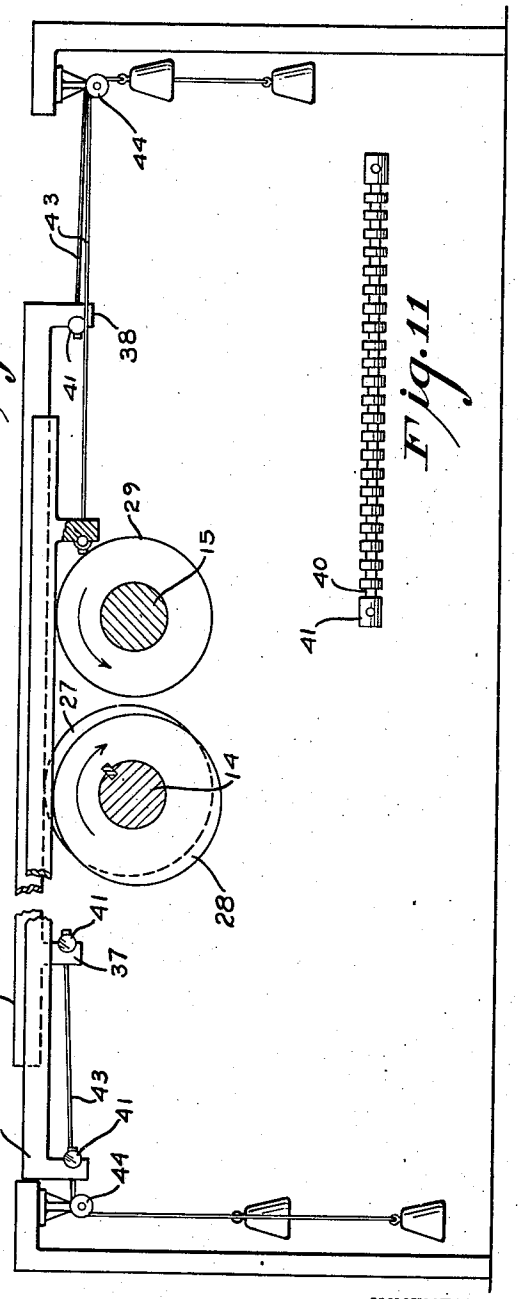


Fig. 10

Fig. 11

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Patented Dec. 26, 1939 2,184,915

UNITED STATES PATENT OFFICE

2,184,915

CONVEYER

David E. Gray, Corning, N. Y., assignor to Corning Glass Works, Corning, N. Y., a corporation of New York

Application June 8, 1937, Serial No. 147,096

5 Claims. (Cl. 198—219)

The present invention relates to conveyers and particularly to conveyers especially suitable for use in advancing ware through an annealing lehr, although not limited to such use.

Conveyers used in annealing lehrs are usually of a type having a continuously moving belt, or of a type having two sets of conveyer bars, one or both sets of which are operated to advance the load through the lehr in a step-by-step fashion.

In conveyers of the belt type, the belts carry heat out of the lehr and must be reheated before again entering the lehr. When the rate of movement of the belt is very slow, as when heavy walled ware is being annealed, the amount of heat carried out of the lehr by the belt and that required to reheat it represents only a small portion of the operating cost. When however, thin walled ware is being annealed the rate of movement of the belt is such that the heat carried out of the lehr by the belt and that required to reheat it becomes a major factor in the operating cost. Bar type conveyers on the other hand have the important advantage over the belt type in that the bars do not carry heat out of the lehr.

A primary object of the present invention is a bar type conveyer which advances the ware by a continuous and smooth movement thereof as distinguished from movement in a step-by-step fashion.

Another object is a bar-type conveyer in which there is a minimum of friction between the moving parts.

The present invention embodies among its features two sets of movable bars each set being supported by one of two sets of bar driving eccentric discs mounted at 180° with respect to one another on suitable drive shafts and which alternately advance the bars from their initial positions to effect the advance of ware, while rollers arranged concentrically on other drive shafts rotating in the reverse direction successively effect the return of the respective sets of bars to their initial positions.

In the drawings,

Fig. 1 is a side elevation of a lehr provided with a conveyer mechanism constructed in accordance with the invention;

Fig. 2 is a plan view of the lehr with certain parts broken away;

Fig. 3 is an end elevation of the lehr with certain parts broken away;

Figs. 4 to 6 are detailed fragmentary views of certain parts of the conveyer mechanisms at different stages of their operation;

Fig. 7 is a perspective view of one form of conveyer bar structure embodying the invention;

Fig. 8 is a side elevation illustrating a second form of conveyer bar structure embodying the invention;

Fig. 9 is a diagrammatic view illustrating paths of travel of the bars of the conveyer mechanism;

Fig. 10 is a side elevation illustrating a third form of conveyer bar structure embodying the invention; and

Fig. 11 is a side elevation of a detail of the structure illustrated in Fig. 10.

The drawings show a conventional form of lehr made of refractory units 11 suitably braced with angle and channel rails 12 and 13. Pairs of conveyer bar drive shafts 14 and 15 pass transversely through the lehr at spaced intervals and are journaled in suitable bearings 16 and 17 on opposite sides of the lehr. Shaft 15 of each pair is driven by a gear 21 in mesh with a similar gear 22 mounted for rotation by a drive shaft 23. The shafts 14 and 15 carry gears 24 and 25 in mesh with each other, so that as shaft 15 of each pair is rotated in one direction by means of power transmitted to it from the main drive shaft 23, the shaft 14 of each pair is rotated in the reverse direction.

Within the walls of the lehr each shaft 14 carries two groups of alternately arranged eccentric discs 27 and 28 mounted 180° with respect to each other, while each shaft 15 has a drum or roller 29 concentrically mounted thereon. Supported at spaced intervals on the eccentric discs 27 on the respective shafts 14 or alternatively by the rollers 29, depending on the instant position of the discs 27, is a set of conveyer bars individually designated 32. Bars 31 of a similar set are likewise supported by eccentric discs 28 when not being supported by the rollers 29.

The eccentric discs 27 and 28 are so positioned with respect to the rollers 29 and of such eccentricity that during approximately 160° of each revolution of the discs their top level is below the top level of the rollers, during which time their conveyer bars are supported by the rollers. This may be accomplished by making the rollers 29 of the same diameter as of discs 27 and 28 and arranging their centers suitably above the axes of the discs, or alternatively by arranging the axes of the discs and rollers in the same plane and by making the diameter of the rollers

slightly smaller than that of the discs. In the instant disclosure the latter course is followed.

It has heretofore been explained that the shafts 14 and 15 rotate in opposite directions and it will be hereinafter assumed that the direction of rotation of shafts 14 is clockwise. It follows, therefore, that during 200° of each revolution of a set of discs that the bars resting thereon will be rolled to the right through a slightly curved path due to the eccentricity of the discs, and that during the remaining 160° revolution of the discs, their bars will be resting on the rollers and will accordingly roll thereon to the left. It will be evident that unless the peripheral speed of rollers 29 is greater than that of the eccentric discs, the bars will be moved farther to the right during a 200° angular movement of the eccentric discs than to the left during the remaining 160° angular movement thereof while they are being supported and moved to the left by the rollers 29. In order to fully return the bars to their initial position, it is therefore necessary to so increase the speed of rotation of the rollers 29 with respect to that of the discs 27 and 28 that the bars just reach their initial position as their eccentric discs complete a revolution in readiness to again move their bars to the right. This difference in speed of rotation is obtained by using gears 24 and 25 of a suitable ratio.

Since the sets of eccentric discs are mounted 180° with respect to each other and drive their respective sets of bars in the same direction during 200° of their rotation, it follows that the level of the two sets of bars will coincide during the early or rising stage of movement of one set and during the final and lowering stage of movement of the bars of the other set. Accordingly, any ware resting on the bars of the latter set will be picked up by the bars of the former and will be carried forward by them. A slight further rotation of the discs supporting the bars last relieved of the ware brings them to rest on the rollers 29 which then return them to their initial position just as their eccentric discs reach the angular position to lift the bars off the rollers to repeat their cycle of movement. From this arrangement it will be noted that there is no sliding contact between the eccentric discs and their bars, the motion being a rolling one in its entirety. The operation will be better understood from a study of Figs. 4, 5 and 6.

In Fig. 4, discs 27 and 28 are illustrated in the position at which the bars 31 are about to be lifted off the rollers 29, while bars 32 (shown in Fig. 3 as carrying ware) are being moved to the right but being gradually lowered toward the roller. In Fig. 9 the level of bars when resting on rollers 29 is represented by the dashed line 50.

In Fig. 5, the discs 27 and 28 are in the position at which both sets of bars are at the same level, both traveling in the same direction and at exactly the same speed. This is the time of transfer of the ware from one set of bars to the other, in this particular instance from bars 32 to 31. The line 51 (Fig. 9) represents the level of transfer.

In Fig. 6, the discs 28 are in their highest position at which time discs 27 are at their lowest position. At this time bars 31 are conveying the ware while the bars 32 are resting on rollers 29 and are, therefore, being returned to their initial position. At this time bars 31 are at a level represented by the highest point of the curved lines 52 and 53 (Fig. 9).

The movement of a piece of ware from point to point and the paths of movement of the bars themselves will be best understood from a study of Fig. 9. In this diagrammatic illustration a point on the ware travels on one set of bars during one-half revolution of their discs from A to B over a curved path represented by line 52 and from B to C on the other set of bars during subsequent half revolution of the discs. A point on a bar travels from A to B over a path represented by line 52 during one-half revolution of its disc and during the next half revolution continues beyond B to D, travels to the left to point E over the path represented by line 50 and then back to A over the path represented by line 52. As clearly illustrated in Fig. 9, the longitudinal motion of bars is great in proportion to their rise and fall; and since the transfer takes place while both sets of bars are at the same level and traveling in the same direction at exactly the same speed, it will be apparent that the transfer is effected smoothly and without interruption.

In order to assist in holding the bars of the respective sets in an edgewise position and to reduce the tendency of warpage and resultant friction between adjacent bars of the two sets, the sets of bars, near their ends, are provided with downwardly extending portions 37 and 38 (Fig. 10) having notched out parts which register with spaced grooves 40 in transverse rods 41 (Fig. 11). These transverse rods are in turn anchored to weighted cables 43 supported on pulleys 44 at the respective ends of the lehr and tend to counteract any tendency of the bars to warp as a result of the high temperatures in the lehr.

If the conveyer is to be used in areas not subject to high temperatures, the transverse rods and their associated parts may be omitted and the structure modified as illustrated in Fig. 8. In this form downwardly extending portions 39 carry weights 45 which maintain the bars in an edgewise position. Abutments 46, one provided at each end of the lehr, serve, during the final stage of movement of a set of bars in either direction, to bring back into alignment any bars of a set which have crept ahead of the others during a movement of the bars in either direction, thereby insuring that they are all in alignment at the beginning of their movement in either direction.

As an alternative to the foregoing arrangement one end of one set of bars may be provided with downwardly extending portions 46 (Fig. 7) fastened together by a bolt 47 passing through these portions and provided with suitable spacers 48. The opposite ends of the bars of the other set (not shown) in this instance are likewise fastened together. In such an arrangement each set of bars is in effect an integral mass, but each bar can expand independently.

I claim:

1. In a conveyer mechanism, a series oppositely eccentrically mounted circular alternately disposed discs, concentrically mounted circular members arranged alongside said discs, means for revolving said discs and members, traveling bars which rest directly upon said discs and are moved by them during a portion of each revolution thereof and which during the remainder of each revolution rest directly upon said members and are moved by them.

2. In a conveyer mechanism, power driven eccentrically mounted discs, conveyer bars supported by said discs and advanced from an initial to an alternative position thereby, and power

driven rollers onto which said discs transfer said bars upon their advancement to their alternative position and by means of which said bars are returned to their initial position.

3. In an article conveying mechanism, sets of ware conveying bars, and means for synchronously moving the bars of said sets between an initial and an alternative position to convey ware from point to point, said means including sets of power driven eccentrically mounted members arranged in rolling contact with said bars so as to effect their forward movement and including power driven rollers brought into rolling contact with said bars by said members to effect their return movement.

4. In an article conveying mechanism, the combination of eccentrically mounted discs rotating in one direction which are alternately oppositely centered, with concentrically mounted rollers rotating in the opposite direction arranged alongside said discs and having their top surfaces arranged in a plane through which said discs pass, and sets of conveyer bars alternately supported and moved back and forth by said discs and rollers respectively.

5. In a conveyer mechanism a set of rotating shafts, cylindrical members concentrically mounted on certain of said shafts, cylindrical members eccentrically mounted on the other of said shafts having a lifting range from a point below to a point above the top of said first members, and a set of bars alternately supported on and rolled back and forth by said sets of members during their rotation.

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