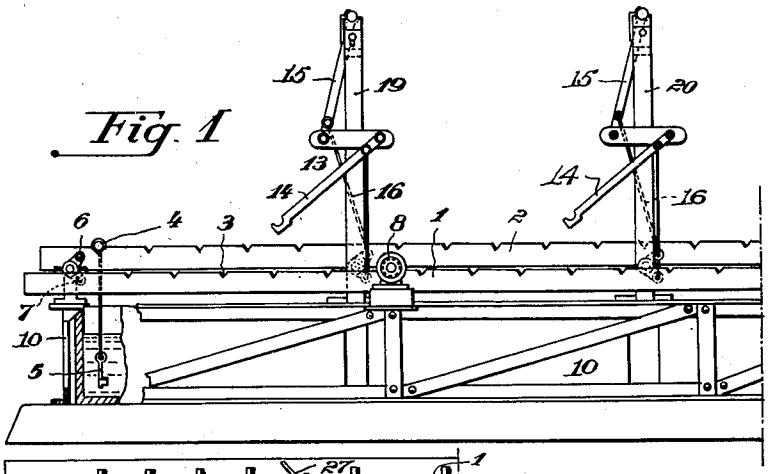
July 5, 1932. J. OERTLI 1,866,124

CONVEYING APPARATUS, PARTICULARLY FOR ELECTROPLATING

Filed Feb. 9, 1928 2 Sheets-Sheet 1

Fig. 1



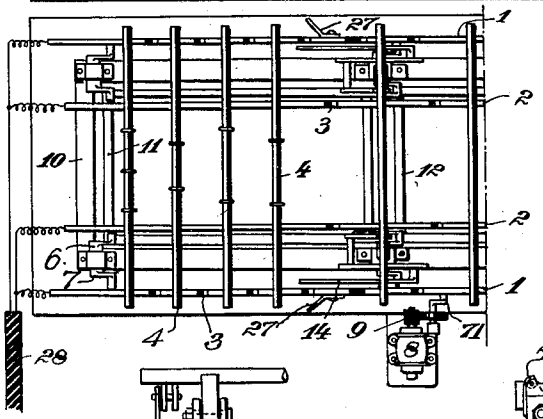


Fig. 2

Fig. 3

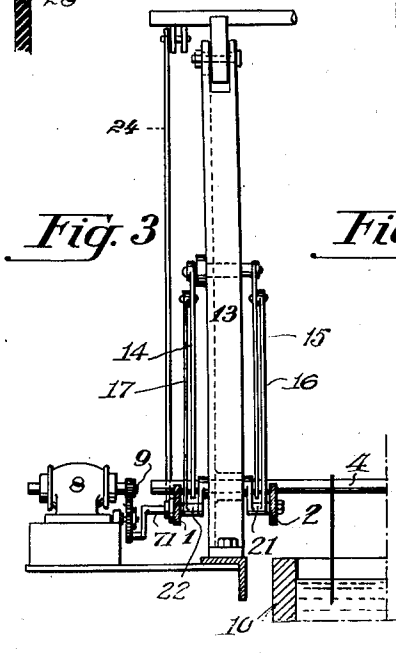
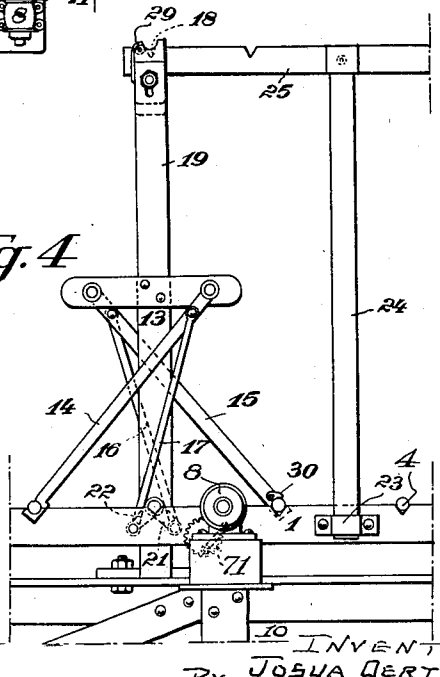


Fig. 4



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Filed Feb. 9, 1928 2 Sheets-Sheet 2

Fig. 5

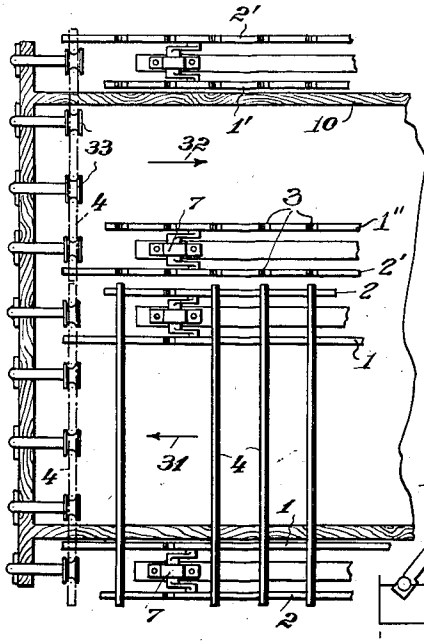


Fig. 7

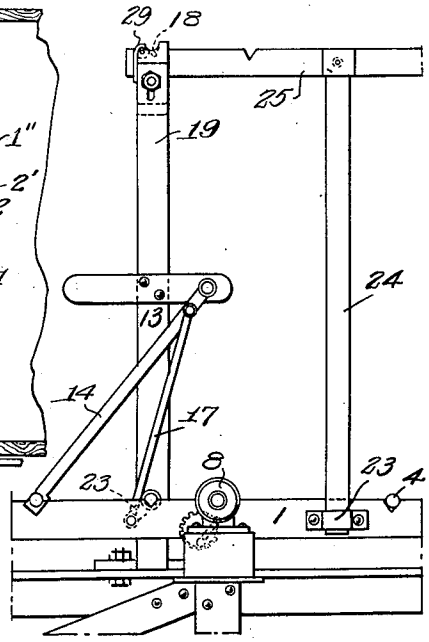
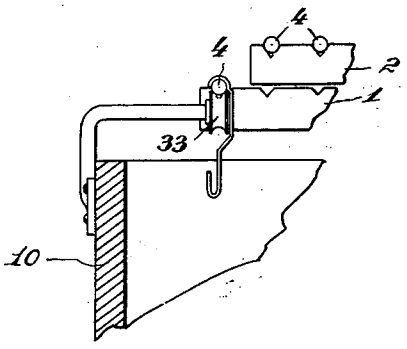


Fig. 6



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UNITED STATES PATENT OFFICE

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CONVEYING APPARATUS, PARTICULARLY FOR ELECTROPLATING

Application filed February 9, 1928, Serial No. 252,967, and in Germany October 5, 1927.

This invention relates to an arrangement for use with baths of various kinds for the treatment of objects, for instance for electrolytic baths for the production of deposits on objects by electrolysis of aqueous solutions or of molten metal or by dipping into molten metal, or for the treatment of objects in cleaning, pickling or rinsing baths. In such baths it is sometimes necessary to treat as quickly as possible large quantities of objects, very often successively in different baths.

Heretofore it has generally been the practice to suspend the objects from an endless chain travelling in a horizontal direction. The transfer of the objects from one bath to the next was also effected in such constructions by means of a conveyor chain travelling in the vertical direction at a higher speed than that of the first chain. Such arrangements are frequently of fairly considerable weight; they require also complicated tensioning devices for the single chains. Finally, for the supply of current, inconvenient constructions are generally made necessary, particularly sliding contacts which are unreliable on account of the nature of the process (such as chemical treatment), as they may become coated or corroded.

The present invention aims to accomplish the movement of objects to be treated through one or more baths in a simple and reliable manner. According to the invention, the objects are suspended in the baths by means of rods or other supporting devices and are alternately placed on and lifted off a frame, which is driven by a crank or eccentric drive in one direction, by another frame which is moved in the same direction of rotation by a crank or eccentric drive displaced relatively to, or out of phase with relation to, the first one, in such a manner that the objects are given a continuous movement of advance in the liquid. In place of two frames there could also be used a larger number which successively and alternately take over the advance of the objects. For many types of treatment it is essential that the movement of the objects should be as uniform as possible, and that they should never stand still in the bath liquid even for an instant. It is an object of the invention to accomplish such result in a simple manner.

As regards its purely outward appearance, the new arrangement is similar to the conveyor devices which have been used up to the present time only for entirely different purposes, for instance for the transport of rolling rods. While in these well known arrangements the primary object is as a rule merely to convey the object from one place to another, with my new arrangement the special and more complex conditions which are associated with treating baths, and particularly with electrolytic baths, are taken into account. For instance, an apparatus of the type indicated must be so designed that the deposit produced on the objects shall be uniform throughout. It has been found that the new arrangement favorably fulfills these conditions, particularly because a substantial vertical component is imparted to the object during its movement.

The transfer of the object from one bath to the next is effected in my improved arrangement in a particularly simple manner. To that end, there are preferably used continuously operating levers which deposit the object-supporting rods on a stand from which they are removed and placed by other levers on an advanced section of one of the transport or conveying frames beyond such transfer point.

An example of the application of the new arrangement to electrolytic baths is illustrated in the accompanying drawings. Figures 1 and 2 show in side elevation and in plan an arrangement for use with two baths. Figures 3 and 4 show a special lever device for the transfer of the objects from one bath to the next, in two different views and on an enlarged scale. In Fig. 5 a so-called travelling bath with my improved apparatus is represented in plan, and in Fig. 6 a detail thereof is shown in side elevation. Fig. 7 illustrates a modified construction.

The essential parts of the new arrangement are two conveyor frames 1 and 2 each composed of two parallel bars which are provided at their upper edges with preferably triangular recesses or notches for the reception of the

rods 4 supporting the objects to be treated. Such an object is indicated at 5 in Figure 1. The two frames 1 and 2 are provided with crank drives 6 and 7 which are displaced relatively to each other preferably by 90°. The single cranks 6 and 7 are driven by a motor 8 which acts through a gearing 9 on the crank 71. The gearing 9 produces a reduction of speed. The shaft of the crank 71 is journalled in the adjacent bar of the movable frame 1, while its arm is journalled at its outer end in the gear which forms the last of the series of gears 9. By its connection with the frame 1, the crank 71 drives the cranks 6 and 7; in place of the cranks eccentrics could also be used. The crank shafts are journalled on a fixed frame or bed 10. Between the two vats or tanks 11 and 12 in which are contained the baths, and on each side of the same, is arranged a lever device 13. This comprises (compare Figures 3 and 4) a pair of levers 14 (one on each side of the vats) which are driven by means of a crank drive 22 secured to one of the bars of the frame 1, through rods 17. Moreover, the lever device comprises another pair of levers 15 which are moved by a crank drive 21, supported by one of the bars of the frame 2, through the rods 16. The two crank drives 21 and 22 are displaced relatively to each other preferably by an angle of 90°. The lever device 13 comprises also a pair of stands 19 which are provided at their upper ends with notches or recesses 18. In the notches 18 and on the levers 15 are mounted springs 29 and 30. On the frame 1 there may be arranged lateral guide members 27 adjacent to the notches 3. These members may be provided either at only a single pair of notches, as shown in Fig. 2, or at all the notches, and also at the notches 18 for the stands 19. The guide members are at least as long as the notches and flare outwardly, so that if a rod 4 has been shifted axially during its transport, it is guided into the middle position on the frames upon encountering the guides. When, therefore, a rod has passed a pair of guides 27, it projects beyond the frame 1 equally on both sides of the latter. Were these guides not present, it would be possible for a rod to continue to shift in one direction until it slid off the conveying frames and into the bath. All the notches are preferably made triangular. When the frames 1 and 2 are simultaneously used for the supply of current, as indicated in Figure 2 by the flexible conductors of the cable 28, the rods 4 are in good electrical contact with the bars 1 and 2, the points of contact being always automatically kept free from oxide when such triangular notches 3 are used. The bars of the frames 1 and 2 are preferably made of a material which is a good conductor of electricity, for instance of copper. If desired, the copper bars provided with the supporting notches, may be upon and insulated from an iron transport frame. The triangular shape of the notches also ensures a very reliable and accurate positioning of the rods.

The working of the arrangement as so far described is as follows: The motor 8 drives the crank drives 6 and 7 through the gearing 9. The two frames 1 and 2 are thus given a longitudinally reciprocating and an up and down movement (wave motion). Owing to the relative displacement of the crank drives 6 and 7, the frames 1 and 2 will reach their corresponding individual positions at different moments. The objects to be treated in the baths 11 and 12 are supported by means of the rods 4 on the transport frame 1 or 2 (whichever happens to be in its highest position). The transport frame carrying the rods then moves downwards while the other transport frame rises at the same time and thereby lifts the rods 4 off the other transport frame. The apparatus is preferably so designed that this passage of the rod from one frame to the other takes place before the frame in question reaches its dead centre. Consequently, the objects suspended to the rods 4 will have a continuous loop-like movement forward. Owing to such movement, the electrolyte comes uniformly in contact with all the surfaces of the object, so that it is possible to ensure a uniform deposit with my improved mechanism without any difficulty. This is an important advantage over known devices having only rectilinear movement, as in such devices the electrolyte is dammed at the front face of the object to be treated. Should some of the rods 4 shift during the further transport, they will be brought back to their correct position by the guide surfaces 27.

During the movement of the frames 1 and 2, the crank drives 21 and 22 will simultaneously move the levers 15 and 14. On one of the rods coming within reach of the pair of levers 14, it will be seized by the latter. The position of the parts at this moment is shown in Fig. 4. The pair of levers 14 moves during the operation of the mechanism in the manner shown in Fig. 1, and raises the rod 4 which it has seized, on to the stand 19, into the notch 18 of which it drops. The rod is held here by the spring 29. The rod lying on the stand is seized then by the pair of levers 15 and deposited again at the other side of the stand 19 on the transport frame 1 or 2, whichever happens to be in the highest position. The springs 30 hold the rods in question fast during the movement of the levers. The position of the parts at the moment at which a rod is deposited by the levers 15, is shown in Fig. 4. By the operation of this lever device, the space or interval between the baths 11 and 12 is bridged over, so that the objects are automatically transferred from one bath to the other. Such

lever devices can be used for any desired number of baths. By way of example, at 20 in Fig. 1, there is indicated a second lever device which transfers the objects from the second bath to a third one.

As a rule it will be advisable to transfer the objects from one bath to another as quickly as possible. This can be done in my improved apparatus in the simplest manner by arranging suitable gears between the two frames 1 and 2 and the rods 16 and 17 driving the levers 14 and 15. The levers 14 and 15 could also be made adjustable if desired. For instance, the articulated joint of the levers 14, 15 with the rods 16 and 17 could be made adjustable within an elongated slot.

In certain installations, it may be necessary that some of the objects do not pass through certain baths thereof. In such a case, the new arrangement could be modified in the simplest manner, as shown in Fig. 7, without modifying the construction of the installation; such change if desired may be made during the use of the apparatus. To that end, the frames 1 and 2 are provided with outer fittings 23. Into these can be inserted vertical supports 24. At the upper end, these supports 24 are connected to further transport frames 25 which are of a construction similar to that of the transport frames 1 and 2. The arrangement is then made in such a manner that the rod is lifted out of the notch 18 of the stand 19 by one of the frames 25 and moved further in a suitable manner as described in the foregoing for the frames 1 and 2. After having passed the desired interval or intermediate space, the rod can be taken off the transport frames 25 by suitable lever devices as described hereinabove, and deposited again on the transport frames 1 and 2.

If the single baths are supplied with current of different strength, it is advisable nevertheless to arrange the transport frames 1 and 2 for the single baths in the same direction, and to provide in them insulating sections at the intervals between the single frames. The current supply to the portions of the frames 1 and 2, thus insulated from each other, can be effected throughout through flexible wires.

The new arrangement can be used with advantage also in the case of the so-called travelling baths as shown in Figs. 5 and 6. By these are understood electrolytic baths in which the objects, after passing through the bath, return to the same place. In order to achieve this, above the bath in question can be arranged next to each other—see Fig. 5—two pairs of frames 1, 2 and 1′, 2′ working in opposite directions as indicated by arrows 31, 32. At the ends of the two pairs of frames there are then arranged for instance rollers 33 which transfer the objects by a simple movement of the rods 4 in the axial direction from one pair of frames to the other. In the arrangement shown in Fig. 5 the frames 1, 2 deposit the rods 4 on the rollers 33 and the frames 1′, 2′ take them therefrom. Further, if desired, suitably designed lever devices such as are shown in Figs. 1 to 4 could be used. They are used then for depositing the objects from one pair of frames on to the roller bearers, while other lever devices lift them off again from the rollers and place them on the second pair of frames which brings them back again to the starting point.

It is a particular advantage of my improved mechanism that a single source of power, namely, the motor 8 can be used to drive all the movable elements, particularly the transport frames 1 and 2 and the lever devices 13 and 20.

What I claim as my invention and desire to be secured by Letters Patent is:

1. Apparatus for conveying objects to be treated through a bath containing a treating or other fluid, comprising, in combination, a plurality of rods for supporting the objects to be treated, at least two frames movably disposed above the bath and provided with notches at the upper surfaces thereof for receiving said rods, lateral guides at said notches for the ends of said rods, a drive for reciprocating one of said two frames through a looped path having a considerable vertical component, a second drive for reciprocating the other of said frames through a similar path, said second drive being so displaced with respect to said first drive, that said objects are given a looped path having a considerable vertical component through the bath, a stand arranged near said frames, a pair of levers operative to lift said rods off said two frames and place them on said stand, and a single motor for continuously actuating said drives and said pair of levers.

2. Apparatus for conveying objects to be treated through a bath containing a treating or other fluid, comprising, in combination, a plurality of rods for supporting the objects to be treated, at least two frames movably disposed above the bath and provided with notches at the upper surfaces thereof for receiving said rods, a drive for reciprocating one of said frames through a looped path having a considerable vertical component, a second drive for reciprocating the other of said frames through a similar path, said second drive being so displaced with respect to said first drive, that said objects are given a looped path having a considerable vertical component through the bath, a stand arranged between said frames, a pair of levers operative to lift said rods off said frames and place them on said stand, and a second pair of levers operative to remove said rods from said stand and place them back onto said frames in the direction of travel of said rods.

3. Apparatus for conveying objects to be

treated through a bath containing a treating or other fluid, comprising, in combination, a plurality of rods for supporting the objects to be treated, at least two frames movably disposed above the bath and provided with notches at the upper surfaces thereof for receiving said rods, a drive for reciprocating one of said two frames through a looped path having a considerable vertical component, a second drive for reciprocating the other of said frames through a similar path, said second drive being so displaced with respect to said first drive, that said objects are given a looped path having a considerable vertical component through the bath, a stand arranged between said frames, a pair of levers operative to lift said rods off said frames and place them on said stand, a second pair of levers operative to remove said rods from said stand and place them back onto said frames in the direction of travel of said rods, a second stand, levers operative to transfer the rods to said latter stand, and a second set of reciprocating frames disposed above and mounted upon said first-named frames and arranged and operated in the same manner as said first-named frames, said second set of frames arranged to receive the rods from said second stand and convey them above the first set of frames, whereby one or more treating vats may be cut out.

4. Apparatus for conveying objects to be treated through a bath containing a treating or other fluid, comprising, in combination, an element for supporting an object to be treated, a first pair of frames movably disposed above said bath, means for imparting reciprocating motion to said frames through looped paths having considerable vertical components and so displaced relatively that said object is given a looped path having a considerable vertical component through the bath, a second pair of frames movably disposed above said bath, means for imparting reciprocating motion to said second pair of frames similarly to said first-mentioned frames, said second-mentioned frames being adapted to convey the objects to be treated through the bath in the opposite direction to said first frames, and a set of rollers located between the delivery end of one pair of frames and the receiving end of the other pair of frames, and adapted to transfer said element from said one pair of frames to the other.

5. The combination with a plurality of vats in longitudinal alignment into which an object is adapted to be dipped for treatment therein, of two sets of horizontally and vertically reciprocable bars extending over all of said vats, means for reciprocating said sets of bars out of phase with each other, a rod adapted to support said object and positionable on said bars to be supported and advanced by said sets of bars alternately, said reciprocating means being so constructed and the phase displacement of said bars being such that said object is given a looped path having a considerable vertical component through the bath, two additional sets of bars located above and connected to said first-mentioned sets of bars, the upper sets of bars being of shorter length than the lower sets and extending over fewer vats than the latter, and means operative to lift said rod from the lower sets of bars at a point adjacent an end wall of a vat and to deposit such rod on the upper sets of bars, whereby one or more vats are cut out from the path of travel of said object.

In testimony whereof I affix my signature.

JOSUA OERTLI.