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BY A. P. C.

J. J. M. L. MARCHAND
CONVEYING APPARATUS WITH ENDLESS CHAIN MORE
PARTICULARLY FOR THE MECHANICAL
DISTRIBUTING AND SORTING
OF LETTERS, DOCUMENTS
OR SIMILAR ARTICLE
Filed Dec. 15, 1942

Serial No.
469,106

3 Sheets—Sheet 2

Fig. 4.

Fig. 5.

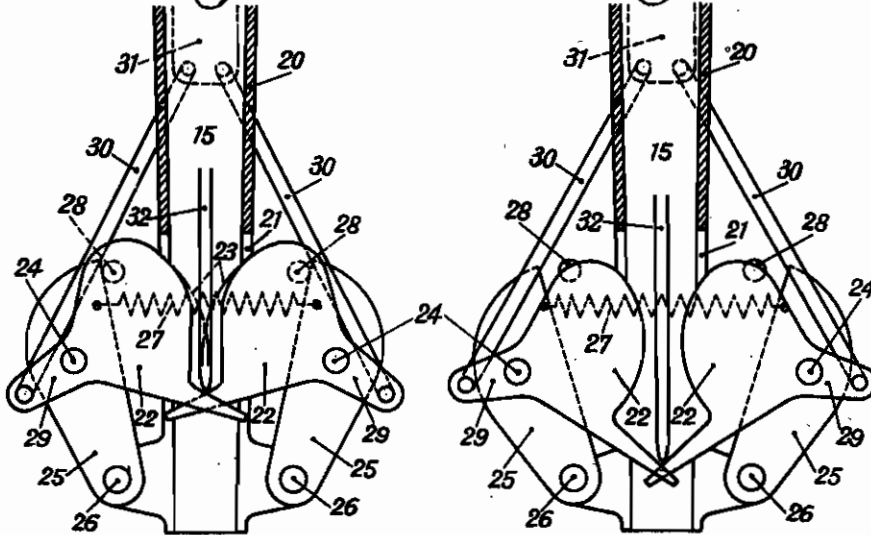


Fig. 6.

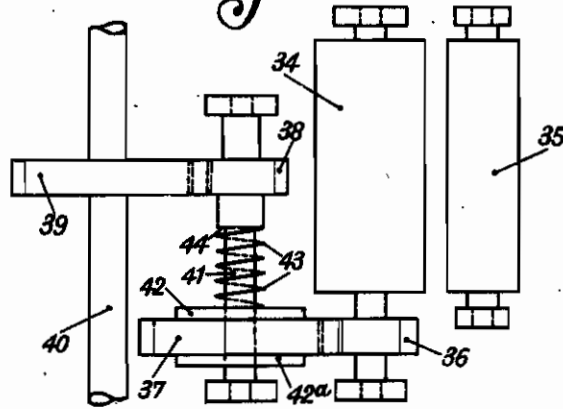
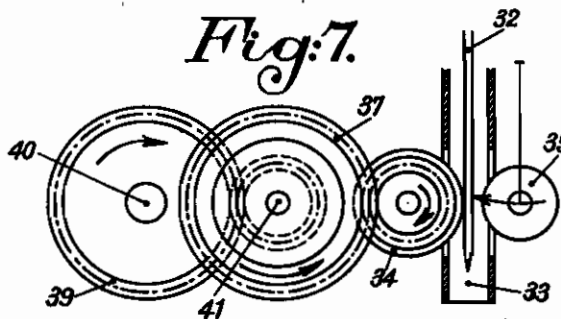


Fig. 7.



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Fig:3.

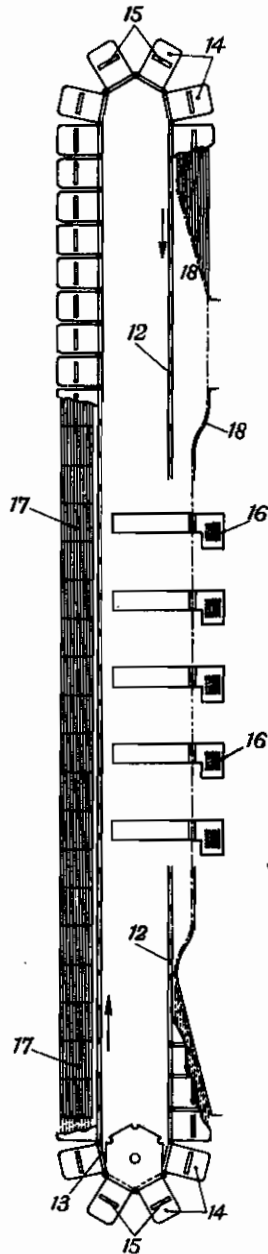
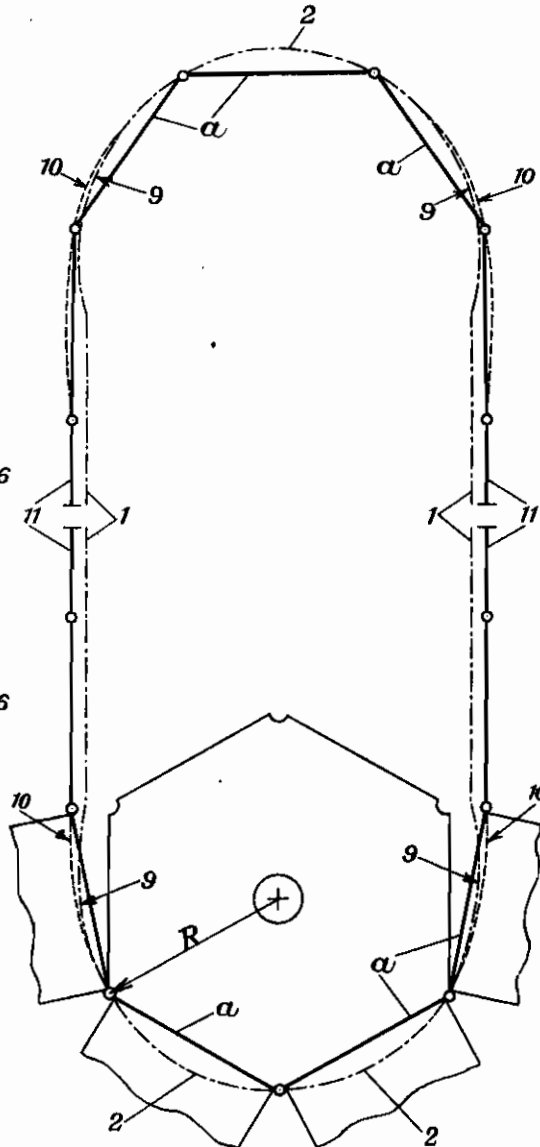


Fig:2.



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ALIEN PROPERTY CUSTODIAN

CONVEYING APPARATUS WITH ENDLESS CHAIN MORE PARTICULARLY FOR THE MECHANICAL DISTRIBUTING AND SORTING OF LETTERS, DOCUMENTS OR SIMILAR ARTICLES

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Application filed December 15, 1942

The invention relates to a conveying apparatus with an endless chain, such as may be applied e. g. in installations for the automatic transfer and sorting of postal matter, such as letters, documents or similar articles from one or more central stations to a plurality of delivery points.

It is of great importance with such type of apparatus, that the conveying of the articles takes place at a high speed, in order to increase as much as possible the output of the apparatus. Moreover, however, it is very important, that the travel of the conveying-chain is as regularly as possible, in order that the intervals of time, in which a given distance every time has to be done, on each moment and under all circumstances synchronise with the intervals between the moment of supply and delivery of the articles.

For that reason the application of an endless band or cable has to be rejected in advance, for in that case cannot be prevented, that said band or cable shall stretch and (or) shrink owing to the surrounding temperature. However the use also of an endless chain has its particular objections, which will come the more to the front, as the speed of motion is higher. Indeed, at each movement of such an endless chain, it occurs at the curves, owing to the chain being constructed with mutually connected, straight links, that at the transfer from a circular into a straight path, alternatively a retardation and an acceleration is caused on the straight part, which results in a jerking or shocking movement of the whole.

Now an object of this invention is to completely overcome said disadvantages and to provide an endless track, comprising a number of circular and straight parts, along which the conveying-chain is moved, whereby at every point of transfer from a circular path into a path according to a straight line or reverse, a special intermediate bridge-part is provided, forming a connection between the circular and straight part of the track and the course of which intermediate bridge-part is designed as a curve in such way, corresponding to the length of the chain-links, that when driving a circular part of the chain with a uniform speed, on each point of the complete track the speed of the chain will be exactly the same and equal to that of the uniform motion.

Although not at all restricted thereto, the invention more particularly is suitable for that type of sorting devices, in which the real conveyer means for the letters, documents or the like, to be distributed, consist in containers, swingable mounted to mutually connected con-

veying-carriages, the sidewalls of these carriages themselves forming the chain links and which endless chain conveyor, thus builded, is continuously moved in a closed cycle over an endless track along one or more control apparatus and along the different places of delivery. Thereby during said cycle the documents to be distributed are in succession deposited at any point of the track and on a given moment in an appropriate container and at another point, determined by the setting in the control apparatus and also at a given moment led from said container up to the place of delivery.

According to another object of this invention said arrangement may be such that at every point of transfer in the cycle of the chain conveyor from a circular path into a path according to a straight line a special intermediate bridge-part is provided, the course of it being designed as a complex, connecting curve, which touches the straight line with a radius of curvature of such size, that the transferring curving thus obtained will asymptotically approach the designed theoretical curve from the point of transfer into the straight path.

The described, new construction according to this invention thus assures under all circumstances a regular travel of the endless chain at a speed, increased as much as possible and that independently of the shape, situation or length of the complete track. This gives the important advantage of a very simple and light construction of the whole, whereas also the friction may be reduced to a large degree. Moreover the working of the parts is influenced in a most advantageously way and only a smaller driving capacity will be required. In a sorting and conveying apparatus as mentioned before, moreover the very important feature is obtained, that it will be possible to distribute articles, such as letters, documents or the like, all of different size and weight in exactly the same manner one with another.

It will be evident, that for a good working of the whole apparatus, there must be taken care that also the automatic supply and delivery of the articles to be distributed, shall be in agreement with the higher speed of motion of the endless chain, that is to say, that both actions also take place with certainty without any retardation or acceleration or without any other deviation at the right moment and at the right point. Indeed, in fact of the higher speed of motion of the endless chain, also the documents are to be

deposited in the containers and delivered at the places of delivery at a higher speed.

An object of the invention therefore is to provide said containers with a special flexible receiving-device in order to prevent a bouncing back of the document, being thrown in at that high speed.

Each of the containers, for the documents to be distributed, travelling together with the endless chain-conveyor for that purpose is provided with revolving, segment-like bottomflaps, adapted to be turned in closed position downwardly, when a document is thrown in by means of a level-system, under the action of a spring, thereby completely damping the inertia of said document, whereas after that they are moved back in the original position again by the spring-action.

Each of the flaps forming the container bottom is pivotally connected to a lever, on its turn being pivotable at one end in a point of the side-wall of the container, whereas both levers in the completely inward position of the flaps are pressed by means of a spring, connected to the other end against fixed abutments.

According to another feature of the invention the segment-like part of each of the bottomflaps is formed with such a rounding, that when rotating round the pivot point of the lever, both parts approach each other and grip the document, being thrown in, whereas at a further movement the shafts are adapted to be turned sidewardly, dependent on the thickness of the document.

Finally a further feature of the invention is the special construction of the details, as will be described in the following and as indicated in the annexed claims.

In order to enable the invention in all its details to be readily understood, reference is made to the accompanying drawings which illustrate, more or less diagrammatically and by way of example, the construction according to the present invention.

Fig. 1 shows the construction of the theoretical as well as the approximate course of the intermediate bridge-part in the chain-track;

Fig. 2 is an upper view of the chain-track according to a practical embodiment of the invention;

Fig. 3 shows a diagrammatical sketch of a sorting and conveying apparatus, on which the invention more particularly may suitably be applied;

Figs. 4 and 5 are views partly in section of a container;

Fig. 6 is a diagrammatical upper view of the supply-mechanism for projecting a document or the like into the container, whereas

Fig. 7 shows the same in front view.

Referring to the drawings, 1 (Fig. 1) is a straight part of an endless chain-track, meeting a circular part 2, so that the line 1 is a tangent to the circle 2, drawn with radius R from the centre 3. The chain-links are indicated with the chord "a" and in this case the length of said links, only for the sake of a clear apprehension, is made equal to the length of the radius R . Thus so far this system of lines shows the normal and usual course of a track for an endless chain, being moved e. g. in the direction of the arrow. Assuming, that the driving takes place in the circular part and the motion in said part is uniform, in that case at the transfer from the circular path into the path according to a straight line, a retardation and alternatively an acceleration will be caused in the straight part, such, that the motion finally shall take place with shocks;

the extent of said retardation and acceleration respectively is proportional to the speed of the chain and the length of the chain-links. In order to obtain also in the straight part of the track the same absolutely uniform motion, according to the invention an intermediate bridge-part is designed between circular and straight path in the following manner:

Starting from the point, in which the retardation is a maximum, that is in the point 4, the point 5 is situated on a distance $=\frac{1}{2}R$ from the radius, drawn from the centre 3 and going through the tangent-point of the circle 2 and the line 1, whereas than the point 4 is given by describing from the point 5 an arc with a radius equal to the length of the chain-link; thus the transferring curve to be designed starts in the point 5. From the point 4 a part is extended, equal to the half-length of the chain-link, in this case $=\frac{1}{2}R$; this gives the point 6. The angle at 3 of the chain-link is bisected and gives the point 7 on the circular path. From this point 7, as well as from the point 6, an arc is described with a radius, equal to the length of the chain-link, viz. in this case $=R$. The point of intersection 8 of said arcs gives a point of the desired transferring curve. In dividing the length of the link extending from the point 4, as well as the angle at 3 on the circle 2, in equal parts, and in repeating the before mentioned construction for each of the division points, the curve 9 is obtained as the course for the transferring bridge-part, whereby said part assures an absolutely uniform speed on the straight part of the track. The complete course of the track 2, 9, 1 is theoretically exact; for practice however a more simple construction of the part 9 is to be attained. For that purpose a tangent is drawn parallel to the curve 9 parallel to the line 1; from the point 5 again an arc is described with the length of the link so that a point 4a is obtained. From this point the same construction, as above described, is repeated, so that a second curve 9a is given; this is repeated so many times, until a final curve 10 is found, being a complex of the designed transferring curves and which curve 10 touches the straight part, formed by the tangent 11. As Fig. 1 illustrates, the radius of curvature is such, that the transferring curve 10 finally approaches the designed theoretical curve asymptotically from the point of transfer into the straight path.

Fig. 2 shows a complete track with a number of intermediate bridge-parts, whereas in the same figure also the complete theoretical course is indicated. The difference between the track 10, 11 and the theoretical course 2, 9, 1 gives an approximation, which implies for practice only a deviation that may be neglected.

From the foregoing it will be clear, that with the new construction, a completely uniform motion will be obtained, more particularly also in the case of a great length of the chain-links and at a high speed in the travel. Now the latter is the case with sorting and distributing apparatus for letters, documents or similar articles of the type, as already mentioned in the introduction of this description.

A scheme of such an apparatus is illustrated in Fig. 3, in which 12 is the track for the endless chain; the links 13 of the chain, being moved over said track are formed by the side-walls of the mutually coupled carriages 14 with the swingable containers 15 connected thereto. The carriages are moved along the bottom of control-apparatus 16, whereby the operator deposits the documents to be distributed one after the other and at the

same time makes a setting on the key-board, in order to determine the place of delivery for said document. In consequence of this setting the several parts of the mechanism may come in action, in such way, that at every turn at the projecting of a document or the like, the latter is brought in a desired container 15, whereas said container is swung out automatically above the inlet of one of a number of chutes 17, guiding the document to the place of delivery, viz. to a given receptacle. To move back again the containers 15 after passing the control-apparatus 16 in the vertical position, contrivances or guide plates 18 are provided.

The Figs. 4 and 5 show the lower part of a container 15; said containers each are formed in the shape of an oblong receptacle, open at upper- and lower side, being relatively small in a direction transverse to that of the movement and from which the flat sidewalls 20 courses in the length of the corresponding carriage. The containers are mounted at the upper side of the carriage-frame in such manner, that they are adapted to swing out in both directions. The lower side of the walls 20 is provided with local recesses 21, through which the bottom-halves are movable for the opening and closing of the discharge mouth of the container. Said bottom-halves are constructed, as illustrated in the given example, by revolving, segment-like flaps 22, which form, in fully inward-position, as indicated in Fig. 4, a closure of the container, leaving between them at the lowest point a receiving opening for the document deposited therein. The flaps 22 are connected to shafts 24, in lengthwise direction being parallel to the walls 20, each of them at the end having bearings, provided in levers 25, which are pivotable in a journal 28 in a fixed point of said sidewalls 20. The levers 25 are mutually connected by a spiral spring 27 or the like, adapted to normally move said levers in a direction corresponding to the closed position, as indicated in Fig. 4, in which position they are pressed against fixed abutments 28. Outside the point of rotation 24, each of the flaps 22 is formed integrally with a crank 29, at the end of which a rod 30 is hingedly connected. Both rods 30 are on their turn hingedly connected to the sliding bar 31, that on the moment on which the container is arrived on the right place of delivery, is adapted to rotate the shafts 24 in such sense, to open said container and to give an opportunity to the document 32 to be shot with the necessary speed into the corresponding delivery-chute.

By throwing a document 32 in the container, said document as a result of the high speed, impinges against the bottom-flaps in the receiving-opening, whereby these flaps, according to the described construction, are turned downwardly into a position, as indicated in Fig. 5. Said turning of the flaps causes a complete damping of the inertia of the document; after that the flaps move back again to their original position according to Fig. 4, under the action of the spring 27. The result is, that—independent of the weight and the speed of the document—a bouncing back of the latter fully is omitted and said document under all circumstances remains in the right position, ready for being delivered. Furthermore the arrangement is such, that at the delivery out of the container, when being opened, the segment-like parts of the flaps 22 are moved according to a path, as indicated with dotted lines in Fig. 4, whereby they are rotated one towards the other and grip the document. At a

further movement both parts approach each other more and more and thereby the shafts 24 are turned more or less outwardly, against the action of the spring 27, dependent on the thickness of the document to be delivered. In that way the latter under all circumstances will be shot outwardly at a high speed into the corresponding delivery-chute.

In the Figs. 6 and 7 the supply-mechanism for the documents or the like is illustrated diagrammatically. Before being deposited in the container, each document is projected by the operator of the key-board at the control-apparatus in a channel 33, closable e. g. by means of a mechanically controlled bottom-valve. As soon as, corresponding with the setting by the operator on the key-board, a carriage with container arrives underneath said channel, the bottom-valve is opened and at the same time the document is gripped between a set of rollers 34 and 35. The roller 34 is continuously driven with a given, relatively high speed, whereas the roller 35 is suspended in swings and is pulled against the roller 34 by means of a lever-system (not shown in the drawings) under the action of a spring. By the rotating of the rollers the document between them is projected with high speed in the container 15, which at that moment is located underneath the channel. The movement of the roller 34 takes place by means of a tooth-gear 36, 37, 38, 39, from the main shaft 40. The toothed wheels 37 and 38 are mounted on an intermediate shaft 41; the wheel 37 is loosely rotatable on said shaft. Between said wheel 37 and the wheel 38, according to the invention, a so-called "slip-coupling" is provided, comprising the coupling-parts 42, 42a, from which the part 42 not only is rotatable with the shaft 41, but also slidable thereon. By means of a spiral spring 43, located with one end to an abutment 44, the coupling-part 42 is continuously pressed in the direction of the wheel 37, said wheel thereby being rotated by friction at a normal speed of transmission and being coupled with the shaft. When depositing alternately and at will documents of different thickness and weight respectively, at the transmission of the speed of rotation of the roller 34 on to the document, the initial speed of the latter may be accordingly more or less adjusted automatically and within given limits. Moreover the providing of the slip-coupling has the important advantage, that when by any cause suddenly an abnormal resistance asserts between the set of rollers 34 and 35, the pressure of the spring 43 will be surmounted, the friction removed and the wheel 37 disengaged, now being free to move loosely about the shaft 41. Such an abnormal resistance thus cannot have any unfavourable action on the further transmission and eventually on the working of the other means, controlled by the setting in the control-apparatus.

The performance, as described in the foregoing by way of example, may be altered in details, without leaving the scope of the invention. The invention also can be applied to installations of the type, in which the chain-track not exclusively is situated in a horizontal plane, e. g. to installations for the distributing of letters or the like over a number of rooms, situated on different floors or in which the documents are conveyed in another way than by means of swingable containers.

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