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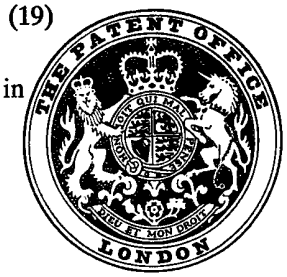

(54) A CONVEYOR, IN PARTICULAR FOR A PROOFING CHAMBER

(71) We, GEBR. VAN CAPELLEVEEN B.V., a Dutch body corporate of Hyperonenweg 30, Utrecht, the Netherlands, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

The present invention relates to a conveyor for use in a proofing chamber for dough portions.

In a proofing chamber, pans are circulated for some time under specific conditions that are favourable to the proofing of the dough portions placed in the pans, and prior art proofing chambers are fitted therefor with a conveyor for circulating the pans in a vertical plane between a feeder station and a discharge station where the pans are introducted into, and removed from the circulation circuit, respectively. A drawback going with the prior art proofing chamber constructions is that the conveyor used therein operates discontinuously i.e., it has to be in the rest position during the supply and discharge of pans, or, in the case of a continuously operating conveyor, complicated feeder and discharge mechanisms are required for the dough pieces, as described in Dutch patent 22,757 of Baker Perkins Ltd. Moreover with respect to the total dimensions of prior art proofing chambers, assuming that the conveyor is incorporated in an insulating housing, the capacity thereof is comparatively small.

The cooling columns employed in bakeries have a larger capacity than prior art proofing chambers. In these coolers baked loaves are advanced on a belt-shaped conveyor along a helical track between a feeder and a discharge station and can cool off during residence in the column. The conveyors used in such coolers have a belt-shaped or lattice-shaped working face on which separate loaves should be able to rest, and as a result are rather complicated and hence expensive.

According to the present invention, there is provided a conveyor for displacing pans containing dough portions in a proofing chamber, along a continuous helical path having parallel straight sections and curves connecting the straight sections, the conveyor comprising at least one link chain of the ship's anchor chain type arranged so that pans to be displaced can be received directly on and be supported by the links, guide tracks for guiding the chain along a continuous helical path, and a plurality of driving means which engage the chain on straight sections of the path at different levels, the driving means comprising driven pocketed sheaves which engage the links of the chain, and chain tensioning means associated with each sheave.

Such a conveyor in a proofing chamber can eliminate the previously described drawbacks of prior art chambers. By application of simple conveying means, the capacity of a cooler of comparable dimensions can be approximated.

The invention is based on the insight that for circulating pans in a proofing chamber it will be sufficient to provide comparatively inexpensive link chains of the ship's anchor type which are guided in guide tracks whereby the portions of the link chain or chains extending beyond the tracks and lying in the transport plane of the conveyor, through engagement with the bottoms of pans positioned thereon, will displace same in a reliable manner. By using a drive of the type described in US patent 3,904,025 having chains extending along the entire path, a minimal chain length and a minimal occupation of space for the conveying means will suffice, while avoiding - by driving the chain in several places - large tensions in the chain with inherent rapid wear and moreover, especially around the curves, unfavourably

high frictions relatively to the guide tracks. The driving pocketed sheaves which, in each of the rectilinear path sections, engage the link chain or chains, may be connected to a single common drive motor. Downstream of each curve, a driving pocketed sheave therefore engages a continuous chain, so that each sheave needs to transmit only a very limited quantity of energy to the chain.

In a conveyor having rectilinear sections, interconnected by bends, it is conventional to pre-stress the bend portions outwardly in order to take up any elongation in the chain occurring during operation. It will be clear that this is a very expensive solution from a constructive viewpoint.

In a proofing chamber with a conveyor as set forth above, there is little room for chain tensioning means, or in general for auxiliary devices, especially when use is made of a plurality of adjacently arranged chains and furthermore when for an optimim capacity of the device, the successive levels are positioned as close as possible to each other.

Taking the above into account, the chain tensioning means for the conveyor according to the invention may comprise a freely rotating tensioning sheave associated with each driven pocketed sheave, the shaft of the freely rotating sheave arranged in the transport direction behind the driven sheave, being pre-stressed in the direction facing away from the driven sheave, e.g. by means of a tension spring. The tensioning means thus need not occupy space in the proofing chamber required for the transport of pans, since the freely rotating sheave can be present at the same level as the driven pocketed sheave and may have substantially the same dimensions.

The driven sheave and the freely rotating tensioning sheave may be arranged in adjacent vertical planes, the link chain being guided over the top of the driven pocketed sheave, subsequently from the bottom towards the bottom of the tensioning sheave, and from the top side thereof again forwardly; downstream of the driven sheave, the chain is brought through side guide tracks from the vertical working plane of the tensioning sheave into the vertical working plane of the driven sheave so that already at a very short distance downstream of the driven sheave, the chain lies again exactly in the extension of the chain portion extending towards the driven sheave.

Summarizing the above it can be stated that the choice of continuous link chains of the ship's anchor type for the transport of pans in a proofing chamber offers many advantages, such as low cost, minimal occupation of space and hence larger capacity of the proofing chamber and, as a result of the slight weight of a link chain as compared to a conveyor belt, a conveyor grid and the like, a low power consumption for the drive.

In a further embodiment of the invention, the proofing chamber may be provided, for better utilization of the inner space thereof, with a conveyor having two concentric helical paths, viz. an ascending and a descending path, which conveyor principle is basically known from German Offenlegungsschrift 2,159,438 of Ballenger, and being characterized in that adjoining, rectilinear track sections of the ascending and the descending helix lie in side by side relationship, in a substantially horizontal plane, so that the respective connection bends are oppositely inclined. It will be clear that in this manner the conveyor supporting carrier frame may be of simple design, since the rectilinear track sections of both the ascending and the descending portion of the conveyor may be made as an integral unit.

According to the invention it is possible in the adjacently positioned portions of the ascending and the descending paths, to mount the driving and/or the tensioning sheaves for the chains of both path portions each time on common shafts so that the drive of chain parts from the ascending and the descending track can each time be driven from a single shaft. This is considerable simpler from a constructive viewpoint and hence cheaper than separate drives.

Some embodiments of the invention will now be described by way of example, with reference to the accompanying drawings, in which:-

Figure 1 is a schematic perspective view of a conveyor having a single spiral track;

Figure 2 is a plan view of the conveyor shown in Figure 1;

Figure 3 is an enlarged detail of the conveyor taken along the arrows III-III in Figure 1;

Figure 4 is a side elevational view along the arrows IV-IV, of the detail shown in Figure 3;

Figure 5 is a sectional view along the arrows V-V in Figure 3;

Figure 6 is a perspective view of a conveyor having two concentric tracks;

Figure 7 is plan view of the conveyor shown in Figure 6;

Figure 8 is a detailed side elevational view along the arrows VIII-VIII in Figure 7 and Figure 6, and

Figure 9 is a view in accordance with Figure 3, of the conveyor in the embodiment shown in Figures 6-8.

The conveyor illustrated in the drawings, especially Figure 1, which is excellently suited for use in a so-called proofing chamber, has a helical transport path comprising substantially horizontal, rectilinear portions 1 and curved bends 2. An arrow 3 indicates the inlet end for pans (not shown) and an arrow 4 shows the outlet end. Figure 2

shows schematically a central drive including a motor 5 and a gearing 6. Though the number thereof is variable, Figures 3-5 show three chains 7. Each chain 7 extends continuously from the inlet end 3 via all rectilinear track portions 1 and bends 2 up to the outlet end 4 and is subsequently passed downwards, back to the inlet end 3.

Chains 7 are link chains, as clearly shown in Figure 5, that is to say, chains composed of links in the form of round or substantially elliptic rings. Throughout the conveying path they are pased over and into guide tracks 8 in such a manner that if pans (not shown) are put on the conveyor they are entrained with the moving chains.

For driving the chains use is made of so-called pocketed sheaves 9 known for the purpose, one of which drivingly engages a chain on each level of the conveyor, preferably on each rectilinear portion 1. From Figures 3 and 5 it can be seen that the pocketed sheaves 9 are mounted on a driving shaft 10, each driving shaft 10 being connected to the gearing 6 (Figure 2).

To maintain a uniform tension in chains 7, a tensioning sheave 11 is provided at each driving sheave 9, behind and offset from the sheave 9. Each tensioning sheave 11 is mounted for free rotation on a shaft 12, which is engaged by a fork 13. Fork 13 is connected to a beam 15 of the frame of the conveyor by means of a tension spring 14.

The chain path in the driving and tensioning means is as follows. A chain 7 arrives at the top of a driving sheave 9 and is passed along the bottom thereof (*7a*) to the bottom of the associated tensioning sheave 11. Part *7b* extending from the top of the tensioning sheave 11 in the direction of transport is laterally displaced with respect to the path of chain 7 and has to be returned therein as soon as possible. To this end, use is made of guide tracks 8′ and 8″, which correspond with tracks 8 but are placed on edge. Guided by the set of tracks 8′ and 8″ the chain 7 traverses a curved "correction path" 7c.

In the embodiment shown in Figures 6-7 a descending path is provided on the outside of the helical, ascending path corresponding with the path of the conveyor shown in Figures 1-5. Both the ascending and the descending path comprise horizontal rectilinear portions interconnected by curved bends. The inlet and outlet end are shown by arrows 3 and 4, respectively. The horizontal rectilinear portions 16 of the ascending path located on the inside of the double helix in the embodiment shown, but which may just as well be located on the outside, are connected at the ends to ascending bend portions 17, and the uppermost horizontal portion 16′ of the ascending portion of the conveyor is connected via an ascending bend 17′ to the uppermost rectilinear horizontal portion 18′ of the descending conveyor path. The remaining rectilinear portions 18 of the descending path are interconnected at the ends by descending bends 19.

Except on the lowermost and uppermost level, the horizontal rectilinear portions of the conveyor each contain a portion 18 of the descending path and a portion 16 or 16′ of the ascending path immediately beside and against one another, so that these rectilinear portions of the conveyor can be produced as a unit, to which portions on each end thereof an ascending bend portion 17 or 17′ and a descending bend portion 19 are connected while being oppositely inclined. In the rectilinear portions of the conveyor the transport directions of the ascending and descending path are the same.

In the spaces indicated by A and surrounded by chain lines are positioned the drives of the chains.

At each level the drive and the tensioning means used correspond with what is shown in Figure 3, the difference being that a double construction is used, as shown in Figure 9, which means that besides the assembly shown in Figure 3 of three driving pocketed sheaves 9 mounted on a shaft 10, three additional such pocketed sheaves 9 are mounted on the extended shaft 10. The superposed shafts 10 may be connected to a common drive motor by means of gears and chain transmissions. Also the shafts 12 for tensioning sheaves 11 may be extended to the adjacent rectilinear conveyor path portion, if desired, and may support three tensioning sheaves 13 for the three chains, assuming that in the embodiment shown in Figures 6-8 use is also made of three parallel chains.

WHAT WE CLAIM IS:-

1. A conveyor for displacing pans containing dough portions in a proofing chamber, along a continuous helical path having parallel straight sections and curves connecting the straight sections, the conveyor comprising at least one link chain of the ship's anchor chain type arranged so that pans to be displaced can be received directly on and be supported by the links, guide tracks for guiding the chain along a continuous helical path, and a plurality of driving means which engages the chain on straight sections of the path at different levels, the driving means comprising driven pocketed sheaves which engage the links of the chain, and chain tensioning means associated with each sheave.

2. A conveyor according to claim 1, characterized in that the chain tensioning means comprises a freely rotating tensioning sheave around which the chain passes associated with each driven pocketed sheave,

the shaft of the freely rotating sheave, which is arranged in the transport direction downstream of the driven sheave, being urged in the direction facing away from the driven sheave.

3. A conveyor according to claim 2, characterized in that each driven sheave and its associated freely rotating tensioning sheave are arranged in offset vertical planes, so that the chain is guided over the top of the driven sheave, then from the bottom of the driven sheave towards the bottom of the tensioning sheave and from the top of the tensioning sheave again forwardly, while downstream of the driven sheave, by means of lateral guide tracks, the chain is brought from the vertical working plane of the tensioning sheave into the vertical working plane of the driven sheave.

4. A conveyor according to any one of the preceding claims, wherein the guide tracks guide the chain along two concentric helical paths, one ascending and one descending path, characterized in that adjoining rectilinear guide track sections of the ascending and the descending paths lie in side by side relationship in a substantially horizontal plane so that the respective guide tracks on the connecting curves are oppositely inclined.

5. A conveyor according to claim 4, characterized in that in the adjacently disposed portions of the ascending and descending paths, the drive and the tensioning sheaves for the chains of both path portions are mounted in respective common shafts.

6. A conveyor substantially as described herein, with reference to the accompanying drawings.

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4 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

FIG. 1

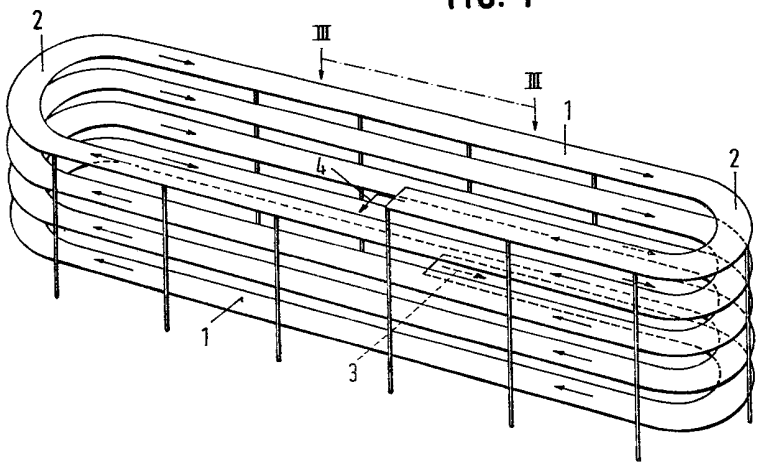
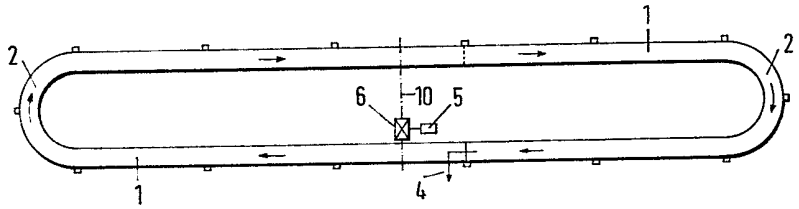


FIG. 2



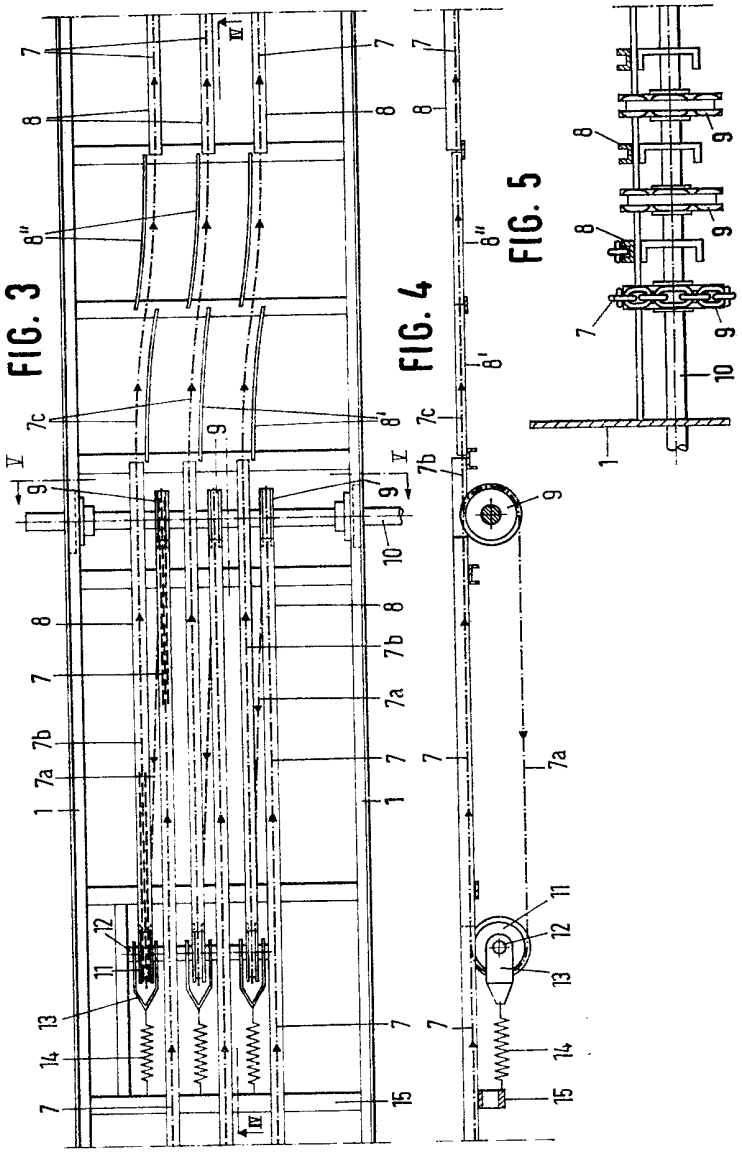


FIG. 3
FIG. 4
FIG. 5

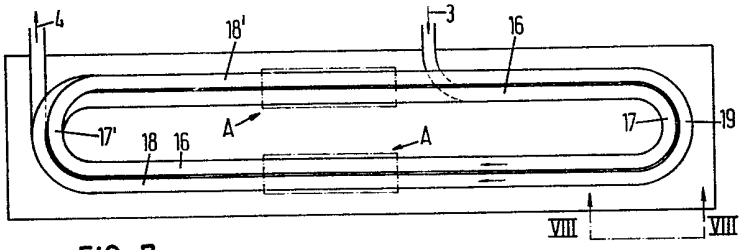


FIG. 7

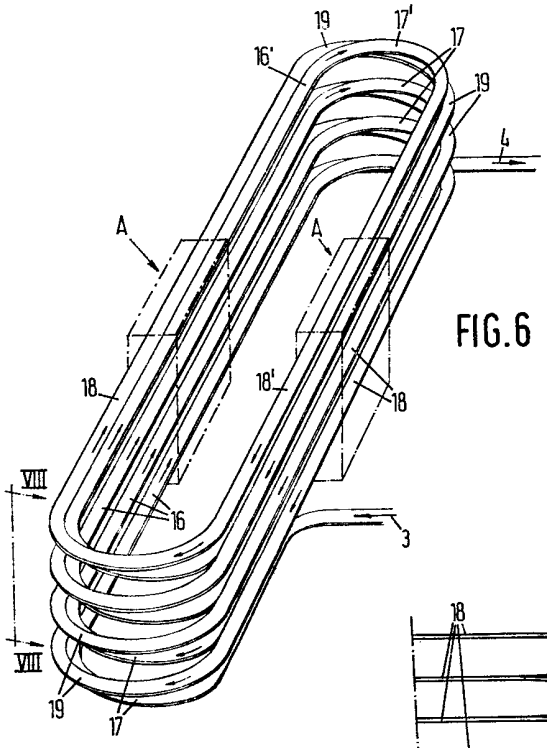


FIG.6

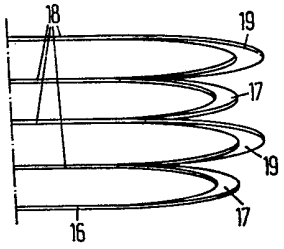


FIG.8

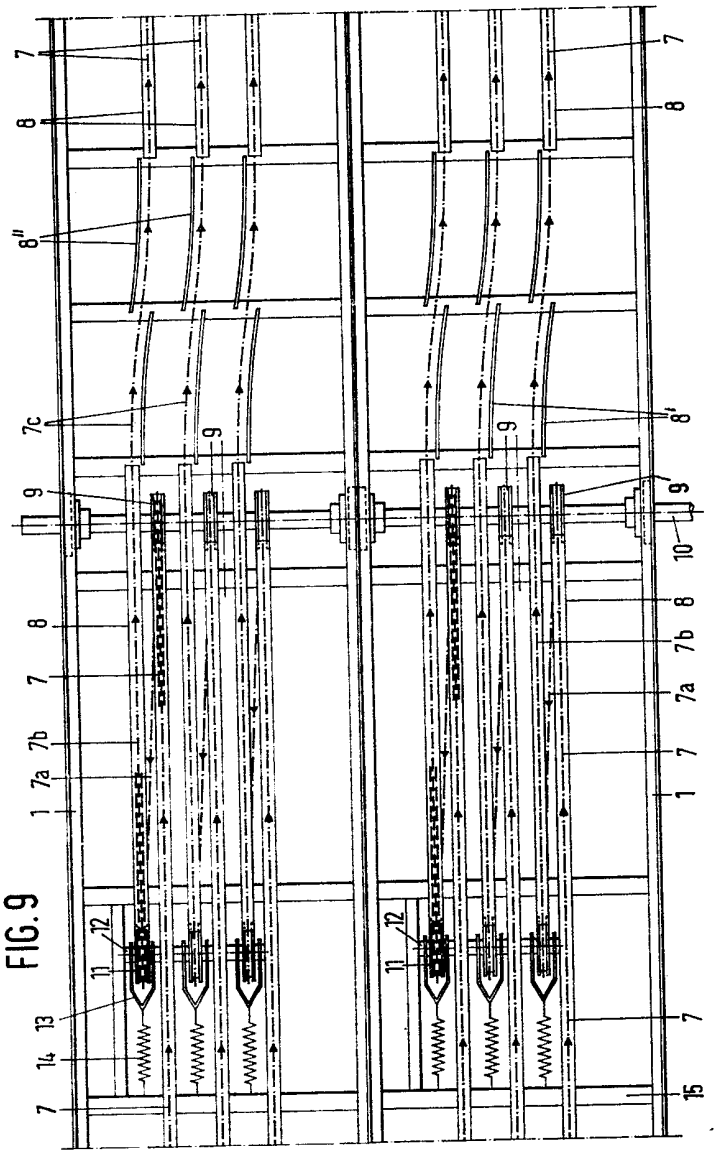


FIG. 9