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CONVEYER FOR DRYING OVENS

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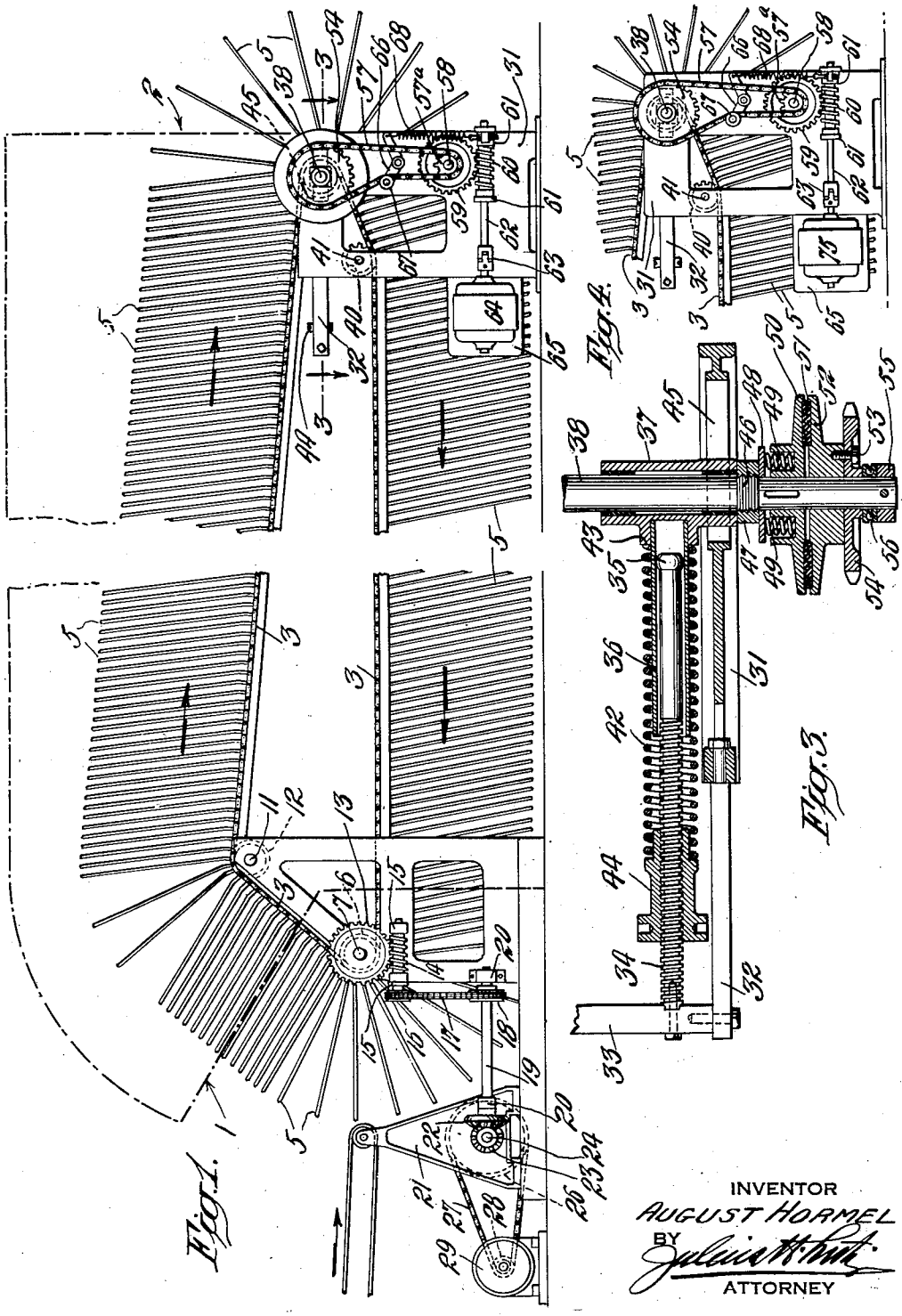


Fig. 1.

Fig. 4.

Fig. 3.

INVENTOR
AUGUST HORMEL
BY Julius H. Smith
ATTORNEY

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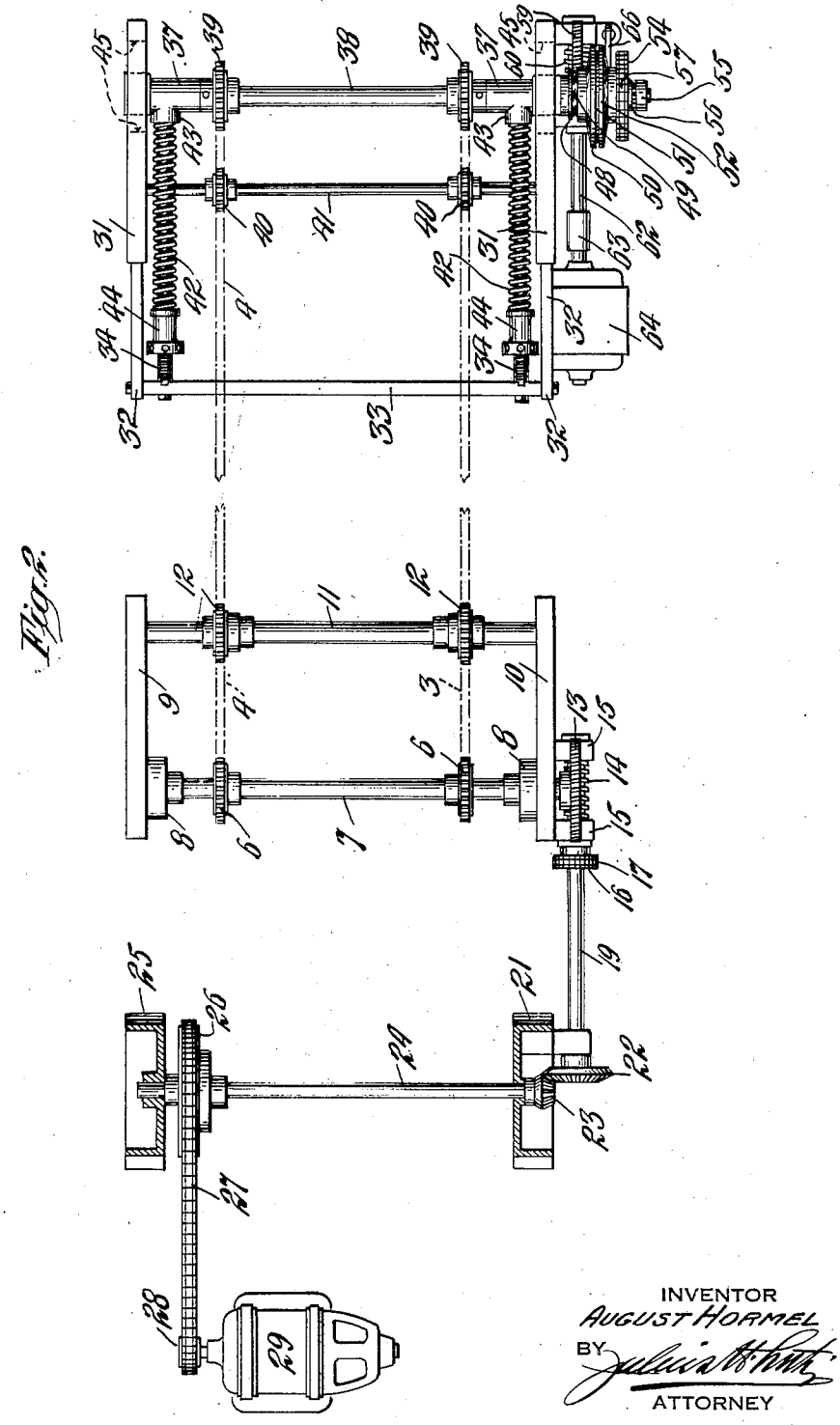


Fig. 2.

INVENTOR
AUGUST HORMEL
BY Julius A. Katz
ATTORNEY

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CONVEYER FOR DRYING OVENS

August Hormel, Hoboken, N. J., assignor to National-Standard Company, a corporation of Michigan

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5 Claims. (Cl. 198—203)

This invention relates to an apparatus for drying freshly varnished or lacquered sheet metal plates, such as are used for the production of can bodies and for other purposes, and the improvements hereinafter specified more particularly relate to the conveyer mechanism employed in such an apparatus. A drying oven of the character mentioned usually consists of a lengthy heating chamber or oven through which the plates to be dried are carried by a suitable conveyer, such conveyer more often consisting of spaced endless chains extending over sprockets which are secured on shafts located at the opposite ends of the chamber, one of the sprocket-carrying shafts being driven from a motor or other suitable source of power. These lengthy chains carry a plurality of wire drying racks which support the plates to be dried in a substantially vertical position, and the chains, due to the weight of the plates and racks; due to expansion under the heat in the chamber, and due also to other factors, often exhibit a tendency to become slack, or to sag.

The object of the present invention is to provide a conveyer to be used for the purpose mentioned, and in other environments where a conveyer of the character described is useful, in which the slack or sagging of the lengthy chains employed in such a conveyer is prevented, resulting in a smooth, even drive.

More particularly, the invention contemplates the provision of independently-operating drive means located at each of the ends of the conveyer, with the drive means at one end thereof tending to rotate the sprocket-carrying shaft which it propels at a speed slightly greater than the speed of the driven shaft at the opposite end of the conveyer, with compensating means, such as a friction clutch or a torque motor or equivalent means, establishing the driving connection. The invention also contemplates the provision of an adjustable mounting for one of the sprocket-carrying shafts as will be hereinafter described.

In the accompanying drawings, wherein an embodiment of the invention is shown, Fig. 1 is a side elevation of the improved conveyer means, a portion of the drying oven in which the conveyer is located being diagrammatically shown; Fig. 2 is a plan view of the same, with parts in section, and with the chains diagrammatically illustrated to more clearly disclose construction; Fig. 3 is a sectional view on the line 3—3 of Fig. 1, looking in the direction of the arrows; and Fig. 4 is a view of a modified structure, wherein a torque motor is used as a substitute for the clutch.

The drying oven or chamber in which the conveyer operates consists of an elongated enclosing having an entrance end 1 and an egress end 2. Located within the chamber and movable therethrough in the direction of the arrows in Fig. 1 is the conveyer consisting of the spaced endless chains 3 and 4, these chains being provided with means for supporting the varnished or lacquered metal plates to be dried, on edge, such means usually consisting of wire holders or racks 5 secured to and projecting from the chains and arranged to hold the plates during the travel of the conveyer. The plates thus transported, are carried along on the top stretch of the conveyer toward the egress end 2 of the chamber where they emerge in a dried condition.

At the front or entrance end of the chamber, the chains 3 and 4 extend over sprockets 6 secured on the shaft 7 mounted to rotate in suitable bearings 8 in the frames 9 and 10. A shaft 11 is mounted in the frame elements 9 and 10, said shaft being provided with the idler sprockets 12 over which the chains 3 and 4 ride. At one end of the shaft 7 is secured a worm gear 13, driven by the worm 14 mounted for rotation in the bearings 15 and having an extended end, carrying sprocket 16, engaged by chain 17 that extends downwardly and around the sprocket 18 secured on shaft 19. Said shaft 19 is rotatable in the bearings 20, one of which extends from the frame element 10, the other bearing projecting from a bracket 21. One end of the shaft 19 carries a bevel gear 22 which meshes with a bevel gear 23 secured at the end of the cross shaft 24 mounted to rotate in the bracket 21 and in a similar bracket 25 spaced therefrom.

Secured on the cross-shaft 24 is a sprocket 26 engaged by a drive chain 27 extending around sprocket 28 on the shaft of electric motor 29. The construction just described constitutes the driving means for the conveyer at the entrance end of the chamber. The opposite end of the conveyer is independently driven, as will be hereafter described, such independent drive means also constituting a chain slack-adjuster whereby the chains 3 and 4 are always held taut during operation of the conveyer.

At the egress end of the chamber is provided a pair of spaced frame elements 30 and 31, each of said frame elements being provided with a projecting arm portion 32, the arm portions being connected by a stationary cross bar 33, as

clearly seen in Fig. 2. Extending laterally from the cross bar 33 adjacent to each of the frame elements 30 and 31 is a threaded guide-rod 34 terminating at its outer end in a rounded head 35 which is smoothly guided within a sleeve 36 (Fig. 3) secured to and projecting laterally from a bearing 37 within which a shaft 38 is rotatable. Secured on the shaft 38 are the sprockets 39 over which the conveyer chains 3 and 4 extend, said chains also extending under the idler sprockets 40 rotating on the shaft 41 mounted in the frame elements 30 and 31.

A spring 42 surrounds the sleeve 36 and has one end bearing against a shoulder 43 provided on the bearing 37 and its opposite end bearing against an adjustment nut 44 adjustable on the threads formed on the rod 34. Since the two bearings 37, carrying the shaft 38 are adjustable longitudinally of the chamber in slots 45 provided in the frame elements 30 and 31, it will be obvious that by adjustment of the nuts 44 on the two rods 34, the shaft 38 may be adjusted in a direction toward or away from the entrance end of the chamber, and that by means of the springs 42 a resilient tension is placed on the chains 3 and 4 co-operating to hold the chains taut.

Shaft 38 is formed with a threaded portion 46 receiving a nut 47 against which bears a plate 48 acting as a pressure plate against which clutch springs 49 bear. Keyed on the shaft 38 is a clutch disc 50 which is held by means of the springs 49 in frictional engagement with the clutch face 51 provided upon a clutch member 52 which is freely rotatable upon the end portion of the shaft 38 and which is secured by screws 53 to a sprocket 54, also freely rotatable on shaft 38 in company with the clutch member 52 to which it is attached, as just described. A bushing 55 pinned on the end of the shaft 38 confines a thrust bearing 56 between it and the sprocket 54 as clearly seen in Fig. 3.

Extending around sprocket 54 is a drive chain 57 which extends downwardly and around the sprocket 57a secured on a shaft 58 mounted for rotation in the frame elements 30 and 31, said shaft also carrying a worm gear 59 engaging and driven by a worm 60 mounted for rotation in the bearings 61 extending from frame element 30. The worm 60 is provided on a shaft 62 which is connected through the knuckle joint 63 with the shaft of electric motor 64 mounted on the extension 65 of the frame element 30. A bell-crank lever 66 is provided at one end with a take-up roller 67 engaging the chain 57 to take up the slack therein, the opposite end of lever 66 being engaged by the end of the tension spring 68.

Briefly, the operation of the improved conveyer is as follows:

The motor 29 at the entrance end of the chamber, drives the conveyer at the desired rate of speed, the plates to be dried being placed on the conveyer at the entrance end of the chamber and removed at the egress end of the same as is clearly understood in this art. Motor 64 at the egress end of the chamber, driving shaft 38 through the clutch connection heretofore described, tries to drive shaft 38 at a slightly greater speed than the speed at which shaft 7 is driven by motor 29. Due to the clutch connection between motor 64 and shaft 38 a compensating action occurs through clutch slippage so that the tendency of shaft 38 to rotate faster than shaft 7 is overcome, but the tendency of shaft 38 being constantly to rotate faster causes all slack in the chains 3 and 4 to be taken up during operation of the conveyer. This, together with the resilient mounting of the shaft 38 and the means by which it is adjusted affords a smooth drive for the chains which during operation of the conveyers are maintained in a sagless condition.

In Fig. 4 a modification is shown, wherein the clutch mechanism operative on shaft 38 is omitted, and said shaft is directly driven by chain 57 which extends over the sprocket 54 which is, in this case, fixed on the end of shaft 38. In this embodiment of the invention, a torque motor 75 is substituted for the conventional motor 64, the torque motor so employed acting as a driving means for shaft 38 and, because of its familiar mode of operation, acting also as a compensating device, tending to drive shaft 38 faster than shaft 7 and thus take up the slack in the conveyer chains.

While I have shown the slack-adjusting means herein described, for use in connection with the conveyers employed in drying ovens, it will be understood that I do not limit the invention to such specific use of the apparatus, since it may be employed to advantage in connection with other types of conveyers.

What I claim is:

1. A conveyer mechanism of the character described comprising, endless chains provided with carrier elements, spaced shafts carrying sprockets around which the chains extend, means for driving one of said shafts from a source of power, means for independently driving the second shaft from a source of power, and a friction-clutch connection between one of the shafts and its driving means whereby the speed of said last mentioned shaft and that of the first shaft may be made to correspond and the slack of the chains may be taken up by the tendency of one of the sources of power to drive its shaft faster than that which is driven by the other source of power.

2. In a conveyer mechanism, an endless conveyer chain, spaced sprockets over which the chain extends, shafts on which the sprockets are mounted, driving means for one of said shafts, independent driving means for the second shaft, said last mentioned driving means being driven faster than the first, a clutch connection between the faster-driven driving means and the shaft which it drives whereby clutch slippage will equalize the rotational speed of both shafts and chain slack will be taken up by the tendency of the faster driving means to rotate the shaft driven by it faster than the other shaft.

3. In a conveyer mechanism, an endless conveyer chain, shafts carrying sprockets around which the chain extends, independently-operating driving means for each of the shafts, the driving means for one of said shafts tending to rotate said shaft at a speed slightly greater than the speed at which the other shaft is rotated by its driving means and compensating means comprising a friction clutch interposed between the faster driving means and the shaft driven by it.

4. In a conveyer mechanism, an endless conveyer chain, spaced shafts carrying sprockets around which the chain extends, independently-operating driving means for driving each of the shafts, a friction clutch interpoed between one of the driving means and the shaft driven by it, supporting means for the last mentioned shaft, said supporting means comprising frame portions slotted to permit bodily movement of said shaft in a direction toward and away from the second shaft, guide means for guiding the movable shaft on its movement toward or away from the other

shaft, said guide means including springs for resisting movement of said adjustable shaft toward the other shaft, and means for adjusting the tension of said springs.

5. A conveyer mechanism of the character described comprising, endless chains provided with carrier elements, spaced shafts carrying sprockets around which the chains extend, a motor and means driven thereby for rotating one of the shafts, a second motor and means driven thereby for rotating the second shaft, and a friction clutch interposed between the second motor and the shaft driven by it to permit slippage to overcome the tendency of said second motor to propel the shaft driven by it faster than the first shaft is driven, and to also enable sag to be taken up in the chain by the effort of the second shaft to rotate faster than the first.

AUGUST HORMEL.