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MECHANISM FOR DRIVING TANDEM MACHINES

Original Filed Sept. 4, 1935 2 Sheets-Sheet 1

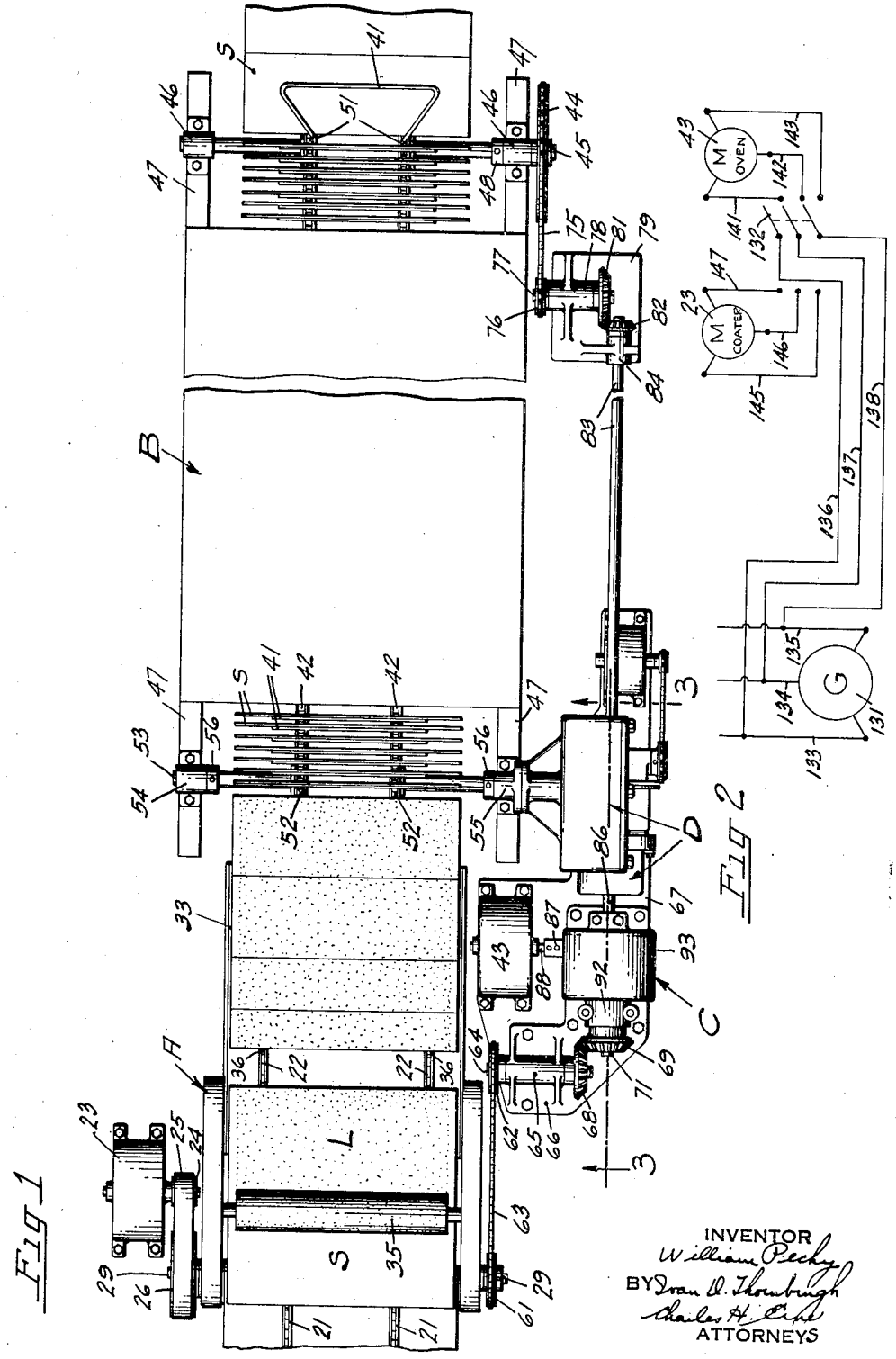


Fig 1

Fig 2

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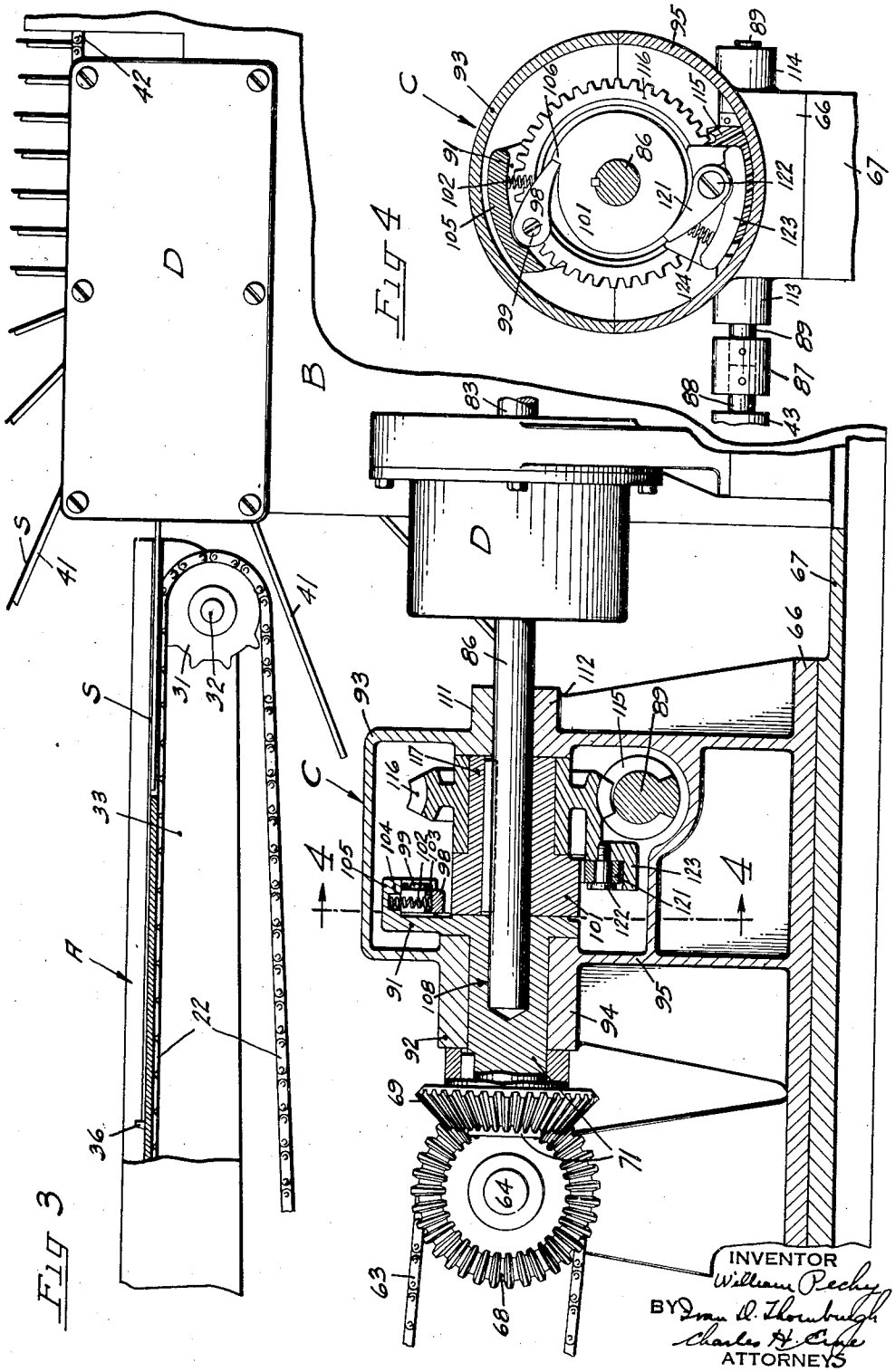


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## MECHANISM FOR DRIVING TANDEM MACHINES

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Original application September 4, 1935, Serial No. 39,181, now Patent No. 2,167,676, dated August 1, 1939. Divided and this application June 13, 1939, Serial No. 278,963

4 Claims. (Cl. 198—76)

The present invention relates to machines which perform cooperatively and successively in tandem upon sheets of tinplate or the like, and has particular reference to driving these machines from a common drive mechanism which will permit operation of one of them independently of the other. This is a division of my United States Letters Patent Number 2,167,676, granted August 1, 1939, on Mechanism for synchronizing tandem machines.

An object of the invention is the provision of a driving mechanism for tandem machines performing operations on sheets of tinplate or the like wherein the machines are operated in unison from a drive common to both of them but which will permit independent operation of one of them in which case work may progress in an uninterrupted flow through one machine while the other is at rest.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

Referring to the drawings:

Figure 1 is a plan view of a pair of machines with driving mechanism embodying the instant invention, with parts broken away;

Fig. 2 is a wiring diagram of the electric apparatus utilized in the machine;

Fig. 3 is an enlarged longitudinal section taken substantially along the line 3—3 in Fig. 1, with parts shown in elevation and parts broken away; and

Fig. 4 is a transverse section taken substantially along the line 4—4 in Fig. 3.

As a preferred embodiment of the instant invention the drawings illustrate a coating machine indicated generally by the letter A in Fig. 1, which applies a film of lacquer L or the like substance to metallic sheets S fed therethrough. The coated sheets coming from this coating machine are transferred to an endless carrier rack of a drying oven B of well known construction wherein the drying of the lacquer is accomplished. A clutch device C shown intermediate and sidewise of the machines A and B (Figs. 1 and 3), provides a flexible, automatically adjustable connection between the tandem machines.

The operation of these various units will now be described in detail in a sequence of presentation which will first develop the cooperation of the essential elements of machines A and B, and then proceed to a more detailed consideration of the mechanical operation of the clutch device or coupling member C in relation to machines A and B.

Referring to Fig. 1, the coating machine A, includes a pair of feed chains 21 for propelling the sheets S through the coating rolls, and a pair of cooperating delivery chains 22 for advancing the coated sheets into the reach of the carrier of the oven B. These chains are driven by a motor or prime mover 23 through a motor pulley 24, a belt 25 and a machine drive pulley 26.

The pulley 26 is mounted upon a feed shaft 29, which carries sprockets (not shown) over which the chains 21 operate. The shaft also carries other sprockets (not shown) over which the chains 22 operate. The chains 22 also take over idler sprockets 31 (Fig. 3) mounted on a shaft 32 journaled in suitable bearings formed in a delivery table 33 of the machine and at the discharge end thereof.

The chains 21 receive uncoated sheets S (Fig. 1) from any suitable source of supply and feed them to a coating roll 35 which applies a film of lacquer or like coating material to the surface of the sheet, the coated areas being indicated by stippling. The roll 35 is carried in suitable bearings formed in side frames of the machine.

The coated sheets when entirely free of the coating roll 35 are engaged by lugs or feed dogs 36 (see also Fig. 3) provided at spaced intervals along the length of the delivery chains 22. These feed dogs and chains advance the coated sheets toward the delivery end of the machine A, where they are received or picked up by substantially U-shaped prongs or flights 41 of a pair of spaced and parallel conveyor chains 42 which pass through the oven B.

The oven chains 42 may be selectively driven either from the motor 23 or from an oven motor 43 in a manner which will be described later. The oven motor 43 may be termed an auxiliary motor or secondary drive. Either motor drive revolves, through the clutch device or coupling member C, an oven drive sprocket 44, mounted on an oven drive shaft 45 having bearings in brackets 46 secured to a frame 47 of the oven B. A collar 48 pinned to the shaft 45 prevents endwise movement of the shaft.

Conveyor chain sprockets 51 are provided at the discharge end of the oven for supporting the chains 42 and these sprockets are keyed to the shaft 45 intermediate the bearings 46. At the opposite or entrance end of the machine, sprockets 52 support the conveyor and these sprockets are mounted on a shaft 53 journaled in bearings

54 and 55, secured to the oven frame 47. Collars 56 pinned to shaft 53 prevent endwise movement of the shaft.

The coating machine A and the oven B are both connected with the clutch device or coupling member C. The coating machine is connected by way of a sprocket 61 mounted on the machine feed shaft 29 and this sprocket drives an auxiliary sprocket 62 through a chain 63 which takes over both sprockets. Sprocket 62 is fixed to a shaft 64 journaled in a bearing 65 formed in a base 66 mounted on a sub-base 67. A bevel gear 68 is pinned to the outer end of the shaft 64 and meshes with a bevel gear 69, keyed to a shaft 71 of the clutch device or coupling member C (see also Fig. 3).

The oven B is connected into the clutch device by way of a gear and sprocket train which includes an endless chain 75 (Fig. 1) which takes over the oven sprocket 44 and also over a driving sprocket 76. Sprocket 76 is mounted on the inner end of a short shaft 77 carried in a bearing 78 of a bracket 79. The outer end of the shaft carries a bevel gear 81 which meshes with a bevel pinion 82 mounted on a long drive shaft 83. One end of this drive shaft is journaled in a bearing 84 of the bracket 79. The opposite end may extend into a machine synchronizing device D such as the mechanism described and claimed in my parent application hereinbefore mentioned. Such a drive connects up with a clutch shaft 86 which is associated with the clutch device or coupling member C.

The oven motor 43 is also connected to the drive clutch device C by a coupling 87 (Fig. 1) connecting a motor shaft 88 to a worm shaft 89 (Figs. 3 and 4). This drive is used on occasions when it is desired to keep the oven B in operation, while the coating machine A and motor 23 are shut down. Such occasion arises, for instance, when it is desired to make changes on the coating machine A, at which time the coating machine is stopped and the coated but undried sheets S then continue to be dried by being further conveyed through the oven B.

The automatic switching from a common drive for both machines, effected by motor 23, to an independent oven drive by motor 43 is under the control of the clutch device C and will now be considered.

The shaft 71 is formed integrally with a plate or pawl arm 91 (Fig. 3) and is journaled in an upper half-bearing 92 formed in a cover 93 (see also Fig. 4). The bearing 92 is bolted to a lower half-bearing 94 formed in a clutch housing 95, which is integral with the base 66.

A pawl 98 (Figs. 3 and 4) is pivotally mounted on the pawl arm 91 by a shouldered pivot screw 99, and its free extremity is held, under spring pressure against the periphery of a single tooth barrel ratchet 101, by a spring 102 set in recesses 103 and 104 formed respectively in the pawl 98 and in an outwardly extending pawl arm flange 105. In Fig. 4, the pawl 98 is shown in driving position, engaging at such time tooth 106 of the barrel ratchet 101 which is keyed to the clutch shaft 86. Shaft 86 is journaled at the left extremity (Fig. 3) in a bore 108 formed centrally of the shaft 71, and adjacent the right end of the ratchet, the shaft 86 is journaled in a pair of half bearings 111, 112. The upper half-bearing 111 is formed in the housing cover 93 and the lower half-bearing 112 in the housing 95.

When the common drive, or coating machine motor 23 is stopped, and the independent or oven motor 43 is started, the pawl 98 no longer drives through the ratchet 101. Worm shaft 89, however, is being rotated through connection with the oven motor 43. The worm shaft 89 is journaled in housing bearings 113 and 114 (see Fig. 4) in the housing 95. A worm 115 (see also Fig. 3) is fixed to the worm shaft 89 and meshes with a worm wheel 116. The worm wheel is loosely mounted on an extension 117 of the ratchet 101, and carries a pawl 121 pivotally mounted on a shouldered pivot screw 122 secured in an extension 123 of the worm wheel. The pawl 121 like pawl 98 is held against the ratchet 101, in this instance, by a spring 124 (Fig. 4) and engages the tooth 106 of the barrel ratchet 101 to drive the shaft 86 through the extension 117 while pawl 98 remains idle.

Reference should now be had to the wiring diagram illustrated in Fig. 2. In this diagram there is indicated an electric generator 131 which is preferably the source of power for the motors 23, 43.

A three-pole double throw switch 132 permits switching from the one to the other of the motors 23, 43. The switch is shown open, but when swung over toward the right, current flows through generator supply wires 133, 134, 135 to switch connecting wires 136, 137, 138, thence through the switch 132 to wires 141, 142, 143 which lead the current to the oven motor 43. This connection sets in motion the motor 43 and the oven B driven thereby.

For the sake of brevity in describing the path of this and other circuits reference is merely made to the current leading or flowing to the energized elements.

If the switch 132 is thrown to the left, the current flows through the switch to wires 145, 146, 147, and hence to the coater motor 23. This connection sets up the operation of both coating machine A and oven B conveyors as previously described.

Thus both machines A and B may be operated in unison from a common drive and also machine B may be operated independently of machine A when the latter is stopped. Hence if desired the oven B may be kept in continuous operation irrespective of the operation of the coating machine A.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. In a pair of machines for operating successively upon sheets of metal to be treated, the combination of separate conveyors for advancing the sheets respectively through said machines, one of said conveyers delivering the sheets after treatment in one machine to the other machine conveyer for a further treatment, a common driving means for both conveyors, an independent driving means for one of said conveyors, and means for selectively actuating said driving means so that both conveyors may be operated in unison from the common driving means or one conveyor may be maintained in operation from said independent driving means while the other machine and its conveyor is at rest, said independent driving means for one conveyor be-

ing at all times out of driving engagement with the remaining machine and its conveyor.

2. In a pair of machines for operating successively upon sheets of metal to be treated, the combination of separate conveyors for respectively advancing the sheets through both of said machines, one of said conveyers transferring the sheets after treatment in one machine to the other machine conveyer for a further treatment, a common driving means for both conveyors, an independent driving means for one of said conveyors, means for selectively actuating said driving means, and a coupling member connected to both of said driving means and through which both of said driving means operate, said coupling member automatically adjusting and transmitting each of the driving forces so that both machines may be operated in unison through their respective conveyors from the common driving means or one machine may be maintained in operation through its conveyor by means of said independent driving means while the other machine is at rest, said independent driving means for one conveyor being at all times out of driving engagement with the remaining machine and its conveyor.

3. In a pair of machines for operating successively upon sheets of metal to be treated, the combination of separate conveyors for advancing the sheets respectively through a coating machine and a drying machine, one of said conveyers delivering the sheets from one machine to the other machine conveyer, a common driving means for the conveyors of both machines, an independent driving means for the conveyor of said drying machine, electrical means for selectively actuating said driving means, a mechanical coupling member connected to both of said driving means and including a ratchet member, a pawl member operatively connected to said common driving means, a second pawl member operatively connected to said independent driving means, said first mentioned pawl being operative to drive both of said machines and their respective conveyors through said ratchet member when said common driving means is actuated, and said second pawl member being operative to drive said drying machine conveyor independently of said first mentioned pawl and through said ratchet member when said independent driving means is actuated and when said coating machine is at rest, said independent driving means for said drying machine conveyor being at all times out of driving engagement with said coating machine conveyor.

4. An apparatus for successively imparting coating and drying treatments to metal sheets, comprising a coating machine and a drying machine, separate conveyors respectively for advancing the sheets through said machines, the conveyer of said coating machine transferring coated sheets to the conveyer of said drying machine, an electro-mechanical common driving means for the conveyors of both machines, an electro-mechanical independent driving means for said drying machine, an electric control for selectively actuating said driving means to drive both machines in unison or said drying machine alone, a mechanical coupling member connected to both of said driving means and comprising a ratchet member directly connected to one of said machines, a pawl member operatively connected to said common driving means, a second pawl member operatively connected to said independent driving means, said first mentioned pawl member being operative to drive both of said machines and their respective conveyors through said ratchet member when said common driving means is actuated, and said second pawl member being operative to drive said drying machine conveyor through said ratchet member only when said independent driving means is actuated and when said coating machine is at rest, said independent driving means being at all times out of driving engagement with said coating machine.

WILLIAM PECHY.