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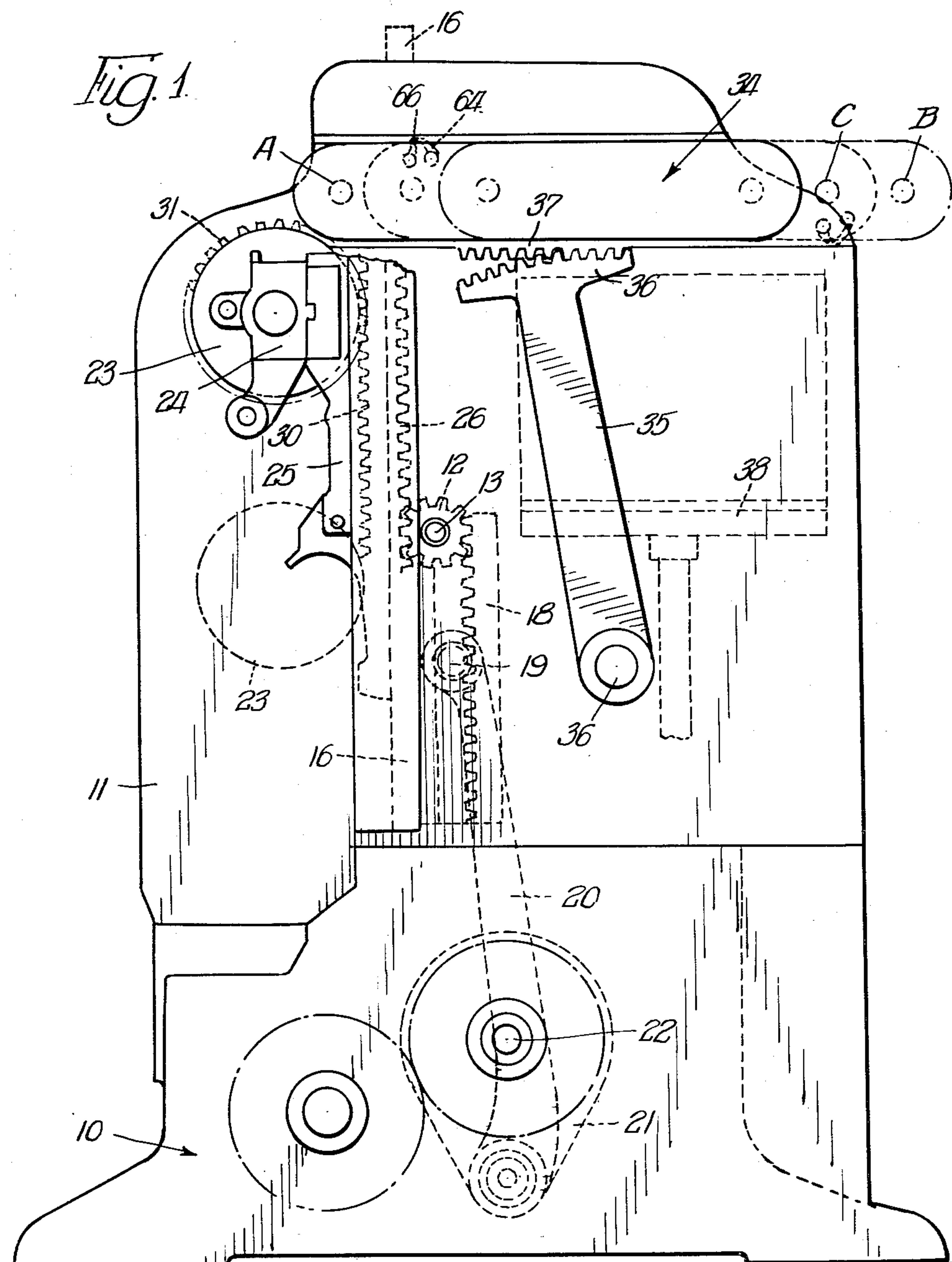
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2,953,089

CHAIN DELIVERY MECHANISM

Filed April 1, 1958

3 Sheets-Sheet 1



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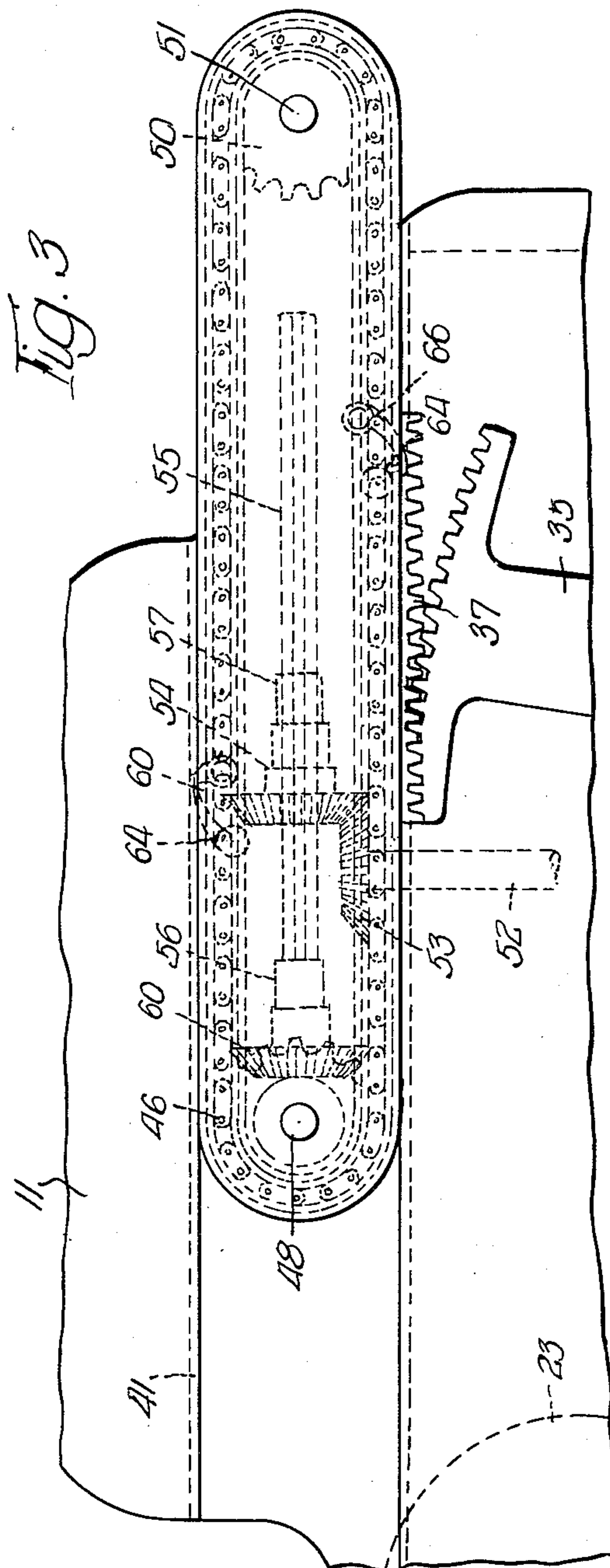
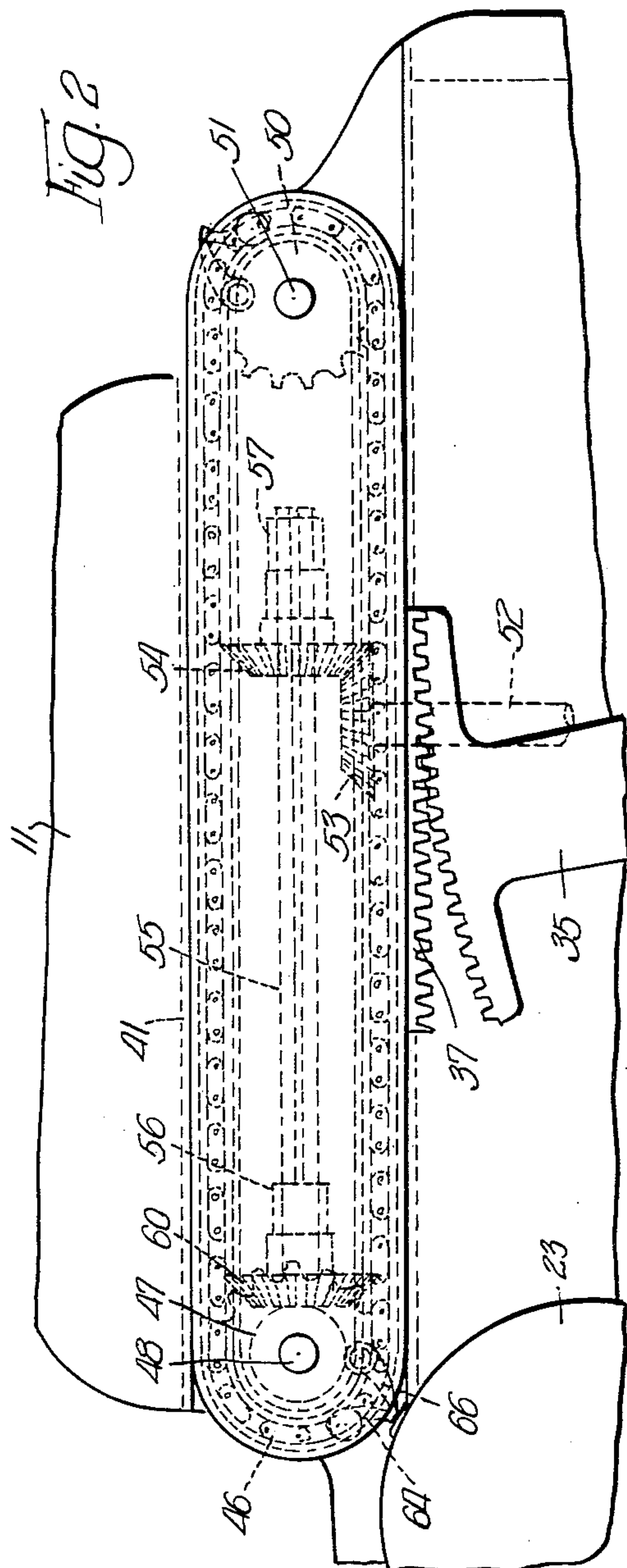
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CHAIN DELIVERY MECHANISM

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3 Sheets-Sheet 2



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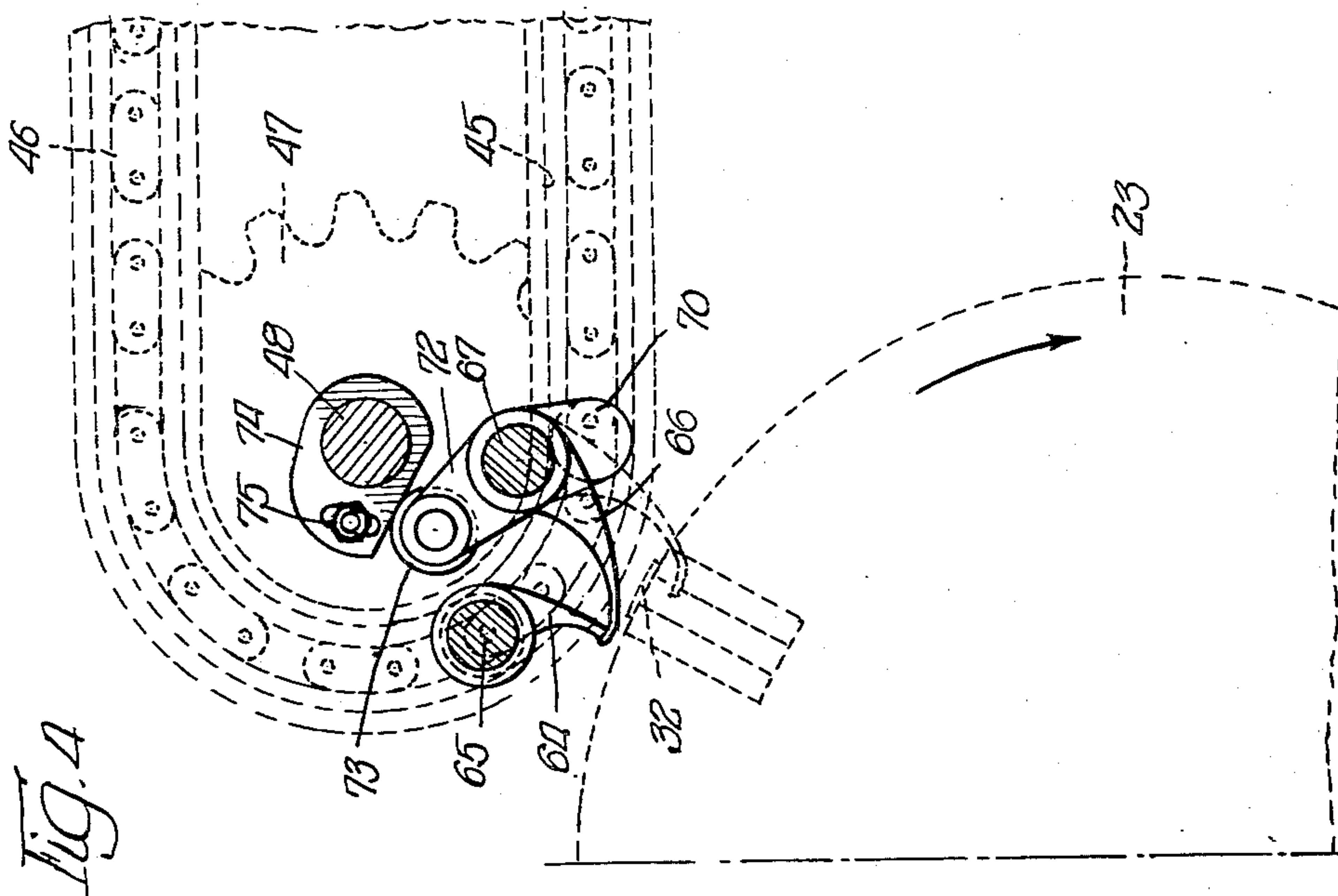
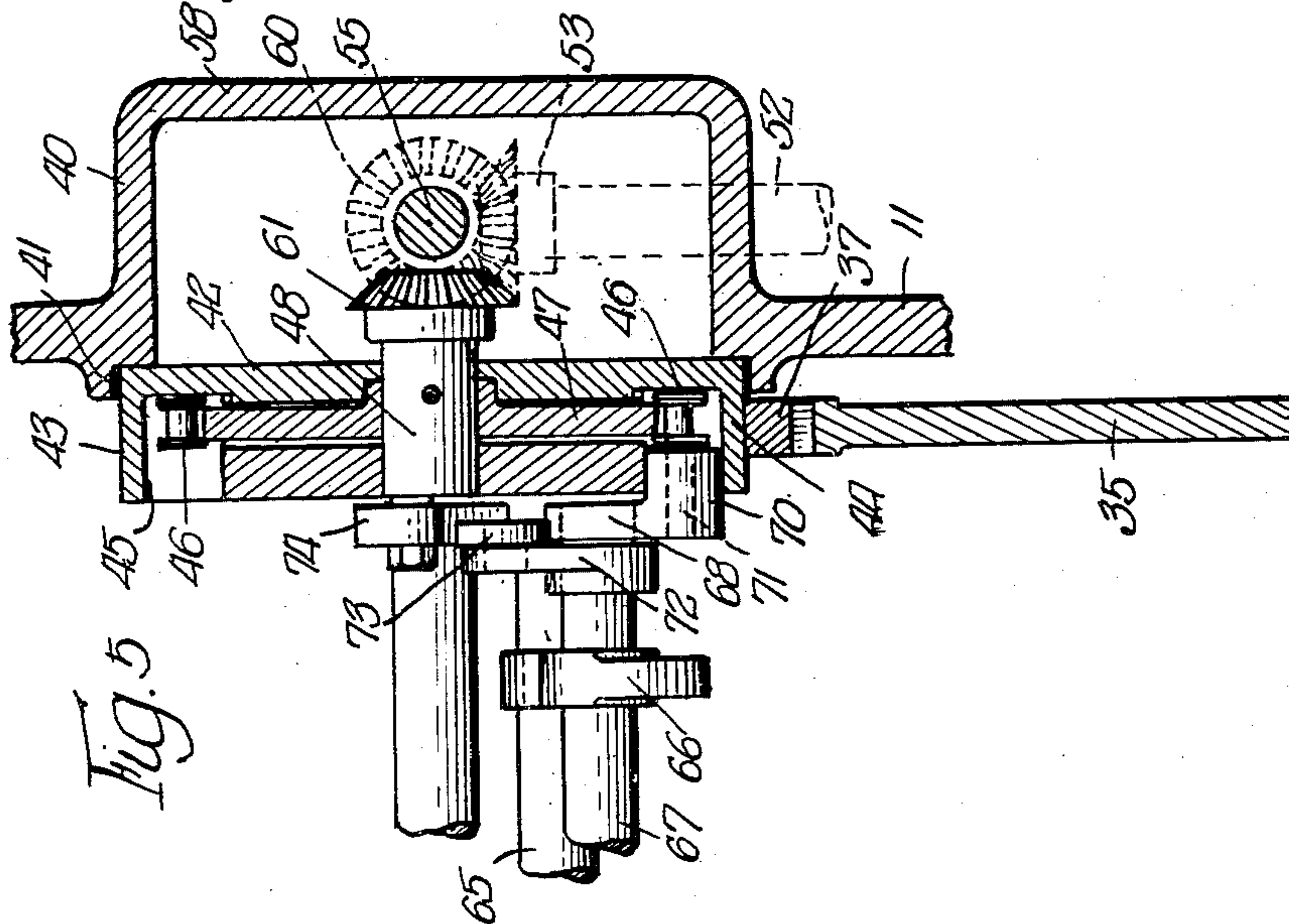
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CHAIN DELIVERY MECHANISM

Filed April 1, 1958

3 Sheets-Sheet 3



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CHAIN DELIVERY MECHANISM

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6 Claims. (Cl. 101—272)

The invention relates to printing presses and has reference more particularly to improvements in sheet delivery mechanism especially designed and adapted for printing presses of the type wherein the impression cylinder reciprocates in a vertical path or wherein the impression cylinder and the type bed both reciprocate vertically but in opposite directions.

An object of the invention is to provide a new and novel sheet delivery unit adapted to have bodily oscillating movement and wherein the unit embodies spaced endless chains to which the sheet grippers are secured and wherein the chains travel over sprockets at respective ends of the sheet delivery unit, whereby the delivery unit is so constructed and arranged that it operates in a manner to considerably increase the hourly production of such printing presses.

Another object is to provide an improved sheet delivery unit which is reciprocated to and from sheet receiving and sheet delivery stations and wherein said unit employs endless chains to which the sheet grippers are attached and which move at a constant speed that is so timed with the reciprocating movement of the unit that the combined action of the parts is to accelerate the sheet grippers as they leave the sheet receiving station and until they approach the sheet delivery station, at which time the combined action of the parts is to cause the sheet grippers to decelerate.

Accordingly, another object is to provide a reciprocatory sheet delivery unit which will accelerate the initial travel of the sheet from the sheet receiving station and until the sheet is about to be released at the sheet delivery station, whereupon the sheet will be decelerated. Initial acceleration of the sheet being delivered is desirable since the tail end of the sheet must miss the upwardly traveling type bed. Also deceleration is desirable just before release of the sheet so as to assure proper depositing of the sheet onto the delivery pile.

Another object is to provide a sheet delivery unit of the character as described which will move the sheet being delivered in a straight line path from the sheet receiving station to the delivery station.

A further object resides in the provision of a reciprocatory sheet delivery unit which will operate in a highly efficient manner to materially lessen the vibration accompanying the operation of the parts by reducing the speed at which the parts are required to operate.

Another object is to provide a reciprocatory sheet delivery unit characterized by having two sets of sheet grippers whereby when one set is releasing a sheet onto the delivery pile the other set of sheet grippers is approaching the sheet receiving station preparatory to receiving a sheet from the impression cylinder.

With these and other objects in view, the invention may consist of certain novel features of construction and operation as will be more fully described and particularly pointed out in the specification, drawings and claims appended thereto.

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In the drawings which illustrate an embodiment of the invention and wherein like reference characters are used to designate like parts:

Figure 1 is a side elevational view illustrating the sheet delivery unit of the invention as applied to a vertical printing press having an impression cylinder and type bed which reciprocate vertically and in opposite directions;

Figure 2 is a fragmentary elevational view showing the sheet delivery unit in sheet receiving position about to receive a sheet from the impression cylinder of the press;

Figure 3 is a fragmentary elevational view similar to Figure 2 but showing the sheet delivery unit at the opposite end of its reciprocating path of movement;

Figure 4 is a fragmentary sectional view taken longitudinally through one end of the sheet delivery unit and showing the sprocket and chain mechanism and the parts for actuating the sheet grippers; and

Figure 5 is a transverse sectional view taken through the delivery unit and which further illustrates the sprocket, chain and sheet gripper mechanism.

The sheet delivery unit of the invention is illustrated in Figure 1 as applied to a vertical type of printing press wherein the impression cylinder and the type bed thereof both reciprocate vertically but in opposite directions. The main frame 10 has mounted thereon the way-frame including two vertically arranged side members 11. Mounted on the way-frame members 11, in approximately mid-position vertically thereof, are a pair of spaced gears 12, said gears being rotatably supported by the trunnions 13. Said gears are thus journaled by the members 11 and said members in addition provide ways for the reciprocable type bed 16. Secured to the rear of the type bed 16 in spaced relation therewith and disposed adjacent each side are the racks 18 which have meshing relation with the gears, respectively, for driving purposes to be referred to later. By means of pins 19 the connecting rods 20 are joined to the racks 18 and said rods in turn are pivotally connected to the cranks 21 of a drive shaft 22 mounted in the main frame of the press.

An impression cylinder 23 is rotatably journaled in the side arms 24 of the cylinder frame 25 which is also mounted on members 11 by means, not shown, so as to reciprocate vertically with respect to said members. In addition to mounting the cylinder frame 25 the structure provides the racks 26 at the sides of the frame and which project rearwardly to have meshing relation with the gears 12, respectively. Thus when the press is in operation the connecting rods 20 transmit a driving force from shaft 22 to the racks 18 which divide the force, part thereof being applied directly to the type bed to reciprocate the bed and part being transmitted by the gears 12 to the racks 26 so that the cylinder frame 25 is also reciprocated but in directions opposite to that of the type bed. In other words, as the type bed 16 moves upwardly the cylinder frame 25 will be caused to move downwardly and vice versa.

On the front face of the type bed there is provided an additional rack indicated by numeral 30 and the impression cylinder at one end thereof is equipped with a driving gear 31. This structure is illustrated in Figure 1, and it will be understood that driving gear 31 meshes with rack 30 so that the gear is driven thereby. Said driving gear 31 is rotatably mounted on the impression cylinder 23 and for operatively connecting the parts a latching pawl is provided. As the cylinder frame 25 and impression cylinder 23 move downwardly from an upper position it will be understood that the driving gear will be rotated in a counterclockwise direction, with the cylinder, however, being held against rotation, since during downward movement a sheet to be printed is registered and delivered to the cylinder sheet grippers 32. Con-

versely, as the cylinder frame 25 and impression cylinder 23 move in an upward direction the driving gear 31 will be rotated in a clockwise direction and since the cylinder is latched to the gear the cylinder will also be rotated. Accordingly, during upward movement of the impression cylinder the same is on impression and the sheet is being printed.

The sheet delivery unit of the invention is located to the rear of the vertical printing press and the said unit is adapted to reciprocate in a substantially horizontal path and which intersects the vertical plane of the type bed 16. In the sheet receiving position A, Figure 1, the delivery unit, identified by numeral 34, is located at the end of its travel in a left hand direction and the sheet grippers of the unit are in position to receive a sheet from the grippers of the impression cylinder, all as best disclosed in Figure 4, and which will be presently described in detail. An oscillating arm 35, pivoted at 36, is provided for reciprocating the delivery unit to impart simple harmonic motion thereto, and for this purpose the arm is provided with a segment 36 having meshing relation with the rack 37 fixed to the unit. From the sheet receiving position A, the delivery unit is reciprocated in a direction toward the right, and position B of the unit indicates maximum travel of the same in this direction. Immediately upon reaching position B reciprocating movement of the unit is reversed and the same starts its travel in a left hand direction. Upon reaching position C the sheet grippers of the delivery unit will be positioned at the right hand edge of the sheet delivery table, at which point in the travel of said grippers the sheet is released for depositing onto the table. Acceleration of the sheet from the sheet receiving station A is effected by the combined action of the unit in bodily moving toward the right and the travel of the chains, to which the sheet grippers of the unit are fixed, also in a direction to the right. This action continues until the sheet grippers approach their position for releasing the sheet. By this time the delivery unit will have reached position B and will be returning on its next reciprocating stroke in a direction toward the impression cylinder. However, during this return movement of the unit from station B to station C it will be understood that the grippers of the unit will still be travelling in a right hand direction so that the combined action of the parts is to decelerate the movement of the sheet grippers as they approach their position of release in order to properly deposit the sheet onto the delivery table 38. The structural details of the sheet delivery unit and the manner of driving the chains thereof at a constant speed while still permitting bodily reciprocating movement of the unit will now be described.

As best shown in Figure 5, each side frame 11 is provided with a horizontally extending housing portion 40 projecting outwardly of the frame and which provides horizontal guideways 41 for receiving the side members 42 of the sheet delivery unit 34. The members 42 are spaced from each other for a distance approximately that of the side frames 11 and which, of course, is determined by the width of the impression cylinder and type bed. Each side member 42 is provided with inwardly directed top and bottom walls 43 and 44, respectively, and which in combination with the members form an oval path 45 for receiving the endless chain 46 and a part of the sheet gripper structure so that said elements are properly confined and guided during their travel. At the forward end of the sheet delivery unit there is located a sprocket wheel 47 over which the endless chain 46 passes, the said sprocket wheel being fixed to and journaled by the drive shaft 48. Likewise at the rear of the unit there is located a sprocket wheel 50, the same also having meshing relation with the endless chain 46 and being journaled in the unit by shaft 51. It will be understood that as the arm 35 oscillates the delivery unit 34 will be reciprocated within the horizontal guideways 41 and simultaneously with this movement the forward sprocket

wheels 47 are driven at a constant speed to impart movement to the chains 46. The main drive shaft 52 is stationary and the same extends through an opening provided therefor to within the housing portion 40 on one side of the printing press. At its terminal end within the housing portion 40 the bevel gear 53 is fixed to said drive shaft and as clearly illustrated in Figures 2 and 3, the bevel gear 53 is adapted to have meshing relation with a similar bevel gear 54. Bevel gear 54 is mounted on shaft 55 by means of a spline connection, the said shaft 55 being suitably journaled for rotation by means of the bushings 56 and 57. Bushing 56 is suitably fixed to and supported by the side member 42 of the delivery unit, whereas bushing 57 is suitably fixed to and supported by the outer wall 58 of the housing portion 40. Accordingly shaft 55 can be continuously driven notwithstanding the bodily reciprocating movement which is imparted to the delivery unit.

The drive to the sprockets 47 is completed by the bevel gear 60 fixed to the end of the shaft 55 projecting beyond bushing 56 for the purpose. Said gear 60 has meshing relation with bevel gear 61 fixed to shafts 48, which in turn journals the sprocket wheels 47 for rotation.

The invention provides two sets of sheet grippers, both sets being fixed to the chains 46 and thus having movement with the chains at a constant rate of speed. When one set of grippers is at the sheet delivery station the other set will be approaching the sheet receiving station and thus the present delivery unit can be operated at a considerably reduced speed to achieve a corresponding reduction in the vibration incident to the operation of said parts. Each set of sheet grippers consists of a stationary pad and a movable pad. As shown in Figures 4 and 5, the stationary pad 64 is suitably fixed to the transverse shaft 65 which in turn is fixed at its respective ends to the chains 46. The movable pad 66 is fixed to the transverse shaft 67 which is journaled at its respective ends by the supporting members 68. Each support member includes a collar or hub portion 70 adapted to ride within groove 45 and which is suitably fixed as by pin 71 to the chain 46. The cam lever 72 is fixed to shaft 67 and the projecting end of the lever carries the roller 73. The cam 74 is positioned on shaft 48 but the cam does not rotate since it is adjustably fixed to the frame of the unit by the nut 75. The sheet gripper mechanism as shown in Figure 4 is so positioned with respect to the cylinder grippers 32 as to receive and grip the printed sheet. The movable pad 66 is caused to open with respect to pad 64 by the action of roller 73 with stationary cam 74 as the structure moves around this sheet receiving end of the unit. Upon receiving the edge of the printed sheet the movable pad 66 is immediately returned to its operative position in contact with stationary pad 64, the net result of the action being to grip the leading edge of the printed sheet between the stationary and movable pads of the sheet gripper mechanism of the delivery unit.

During operation of the printing press the reciprocating movement of the sheet delivery unit 34 is so timed with the up and down travel of the type bed 16 that although the delivery unit intersects the path of travel of the type bed there is no interference in the operation of either part. When the type bed is in its up position and the impression cylinder is in a down position, the delivery unit will be located at station B. The parts then reverse their direction of movement and the delivery unit and cylinder eventually coact for the transfer of the printed sheet to the grippers of the unit. The delivery unit has a straight line path of movement and operation of the unit is characterized by initial accelerating travel of the printed sheet in order that the sheet will completely miss the upwardly moving type bed. Before releasing the sheet its speed of travel is caused to decelerate and this assures proper depositing of the printed sheet onto the delivery table.

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The invention is not to be limited to or by details of construction of the particular embodiment thereof illustrated by the drawings, as various other forms of the device will of course be apparent to those skilled in the art without departing from the spirit of the invention or the scope of the claims.

What is claimed is:

1. In sheet delivery mechanism, the combination of a frame mounting a printing cylinder and a type bed for vertical reciprocating movements in directions opposite to each other, cylinder grippers on the printing cylinder for holding a sheet to be printed, a sheet delivery unit mounted by the frame rearwardly of the type bed for horizontal reciprocating movements in directions to and from the vertical path of the printing cylinder, said unit including spaced sprockets journaled by the unit and endless chain mechanism having meshing relation with the sprockets and being driven thereby, said unit being so constructed and arranged that the top and bottom runs of the endless chain mechanism are substantially parallel to the reciprocating movements of the unit, sheet gripper means carried by the chain mechanism, means for rotating the sprockets to cause movement of the chain mechanism, and other means for reciprocating said unit in timed relation to that of the printing cylinder and type bed, whereby the unit intersects the path of the type bed when said bed is located completely below the unit so that the sheet gripper means may coast with the cylinder grippers to receive a sheet therefrom.

2. Sheet delivery mechanism as defined by claim 1, wherein the means for rotating the sprockets effects travel of the bottom run of the chain mechanism in a direction away from the path of the printing cylinder.

3. Sheet delivery mechanism as defined by claim 1, wherein the means for rotating the sprockets effects travel of the bottom run of the chain mechanism in a direction away from the path of the printing cylinder, and wherein the sheet gripper means includes two sets of grippers spaced equal distances from each other.

4. Sheet delivery mechanism as defined by claim 1, wherein the means for rotating the sprockets includes a driving shaft carried by the unit, a gear having a splined, nonrotatable mounting on the shaft, said splined connection of the gear and shaft permitting relative movement axially of the shaft, whereby continuous rotation can be imparted to the gear notwithstanding the reciprocating movements of the unit.

5. In sheet delivery mechanism, in combination, a sheet delivery unit for receiving sheets at a sheet receiving

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station and for releasing said sheets at a sheet delivery station, means mounting said delivery unit for reciprocating movement from a position beyond the delivery station to said receiving station and return, sheet grippers carried by the delivery unit and adapted to move in an oval path back and forth from end to end of the unit and substantially parallel to the reciprocating movements of the unit, and means for moving the sheet grippers at a constant speed and in a direction away from the sheet receiving station during movement of the unit in the same direction, whereby the grippers travel at an accelerating speed as they move away from the sheet receiving station due to the combined movement of the unit and the grippers, and said gripper movement and reciprocating movement of the unit being timed so that the unit has reached its position beyond the delivery station and is returning as the grippers approach said delivery station, whereby the said grippers travel at a decelerating speed prior to and during release of the sheet.

6. A delivery mechanism for conveying sheets in a horizontal path from a sheet receiving station to a sheet delivery station comprising, a reciprocable frame member, a pair of transversely spaced, endless chains supported by said frame member, sheet grippers carried by said chains, means for driving said chains at a constant normal speed and in a direction whereby the bottom runs of the endless chains travel from the sheet receiving station to the sheet delivery station, additional means for reciprocating said frame member between the sheet receiving and sheet delivering stations, said reciprocating motions being timed whereby the grippers moving with the bottom run of the chains are accelerated above normal chain speed as they move a sheet from the sheet receiving station, due to the combined motion of the chains and the frame member in the same direction, and whereby the said grippers are retarded below normal chain speed as they approach and release the sheet at the delivery station, due to the reverse movement of the frame with respect to the direction of chain travel.

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