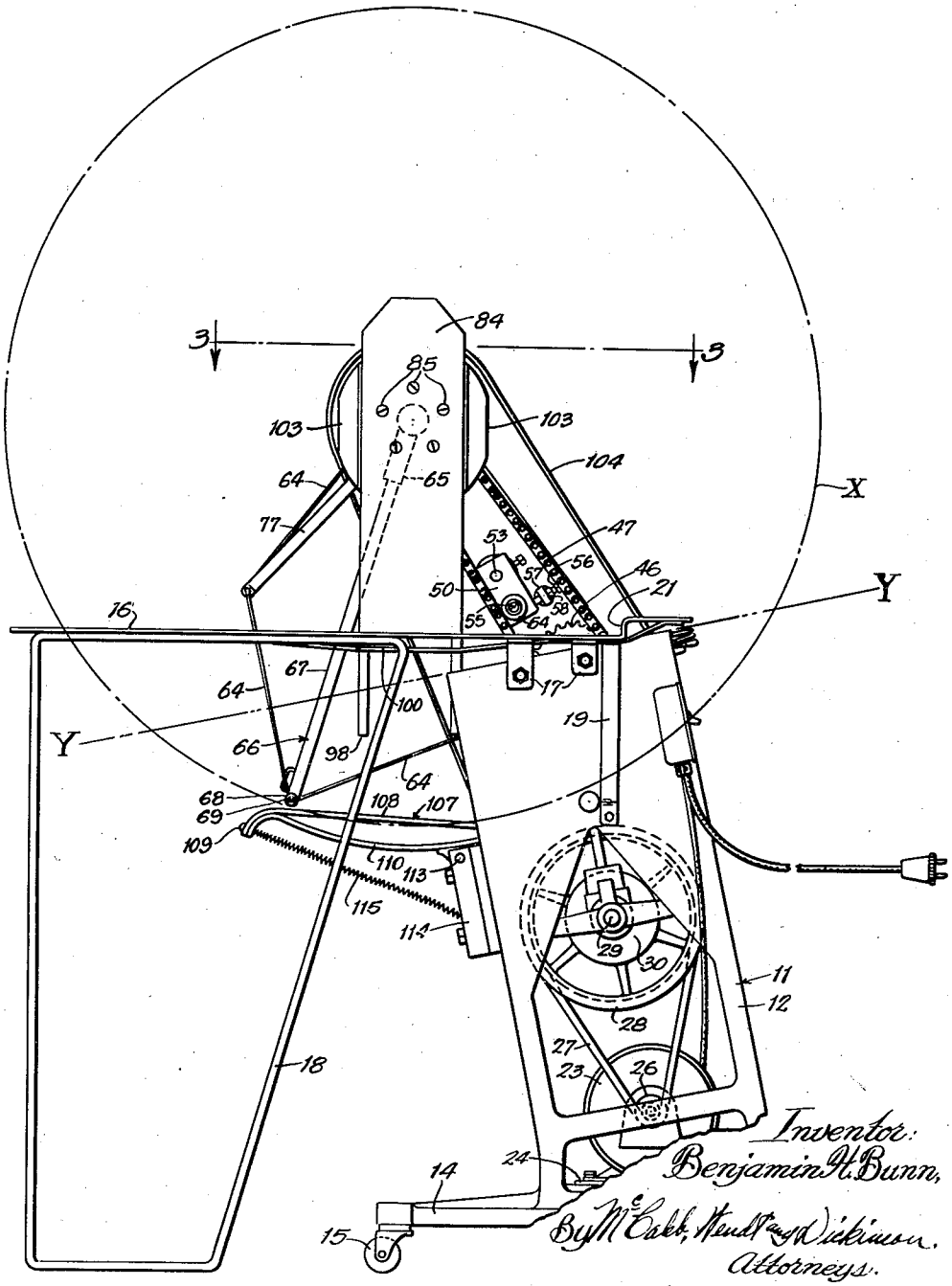
March 6, 1945. B. H. BUNN 2,371,024

TYING MACHINE

Filed Feb. 10, 1942 6 Sheets-Sheet 1

Fig. 1



Inventor:
Benjamin H. Bunn,
By McCabe, Hendrickson & Dickinson.
Attorneys.

March 6, 1945. B. H. BUNN 2,371,024

TYING MACHINE

Filed Feb. 10, 1942 6 Sheets-Sheet 2

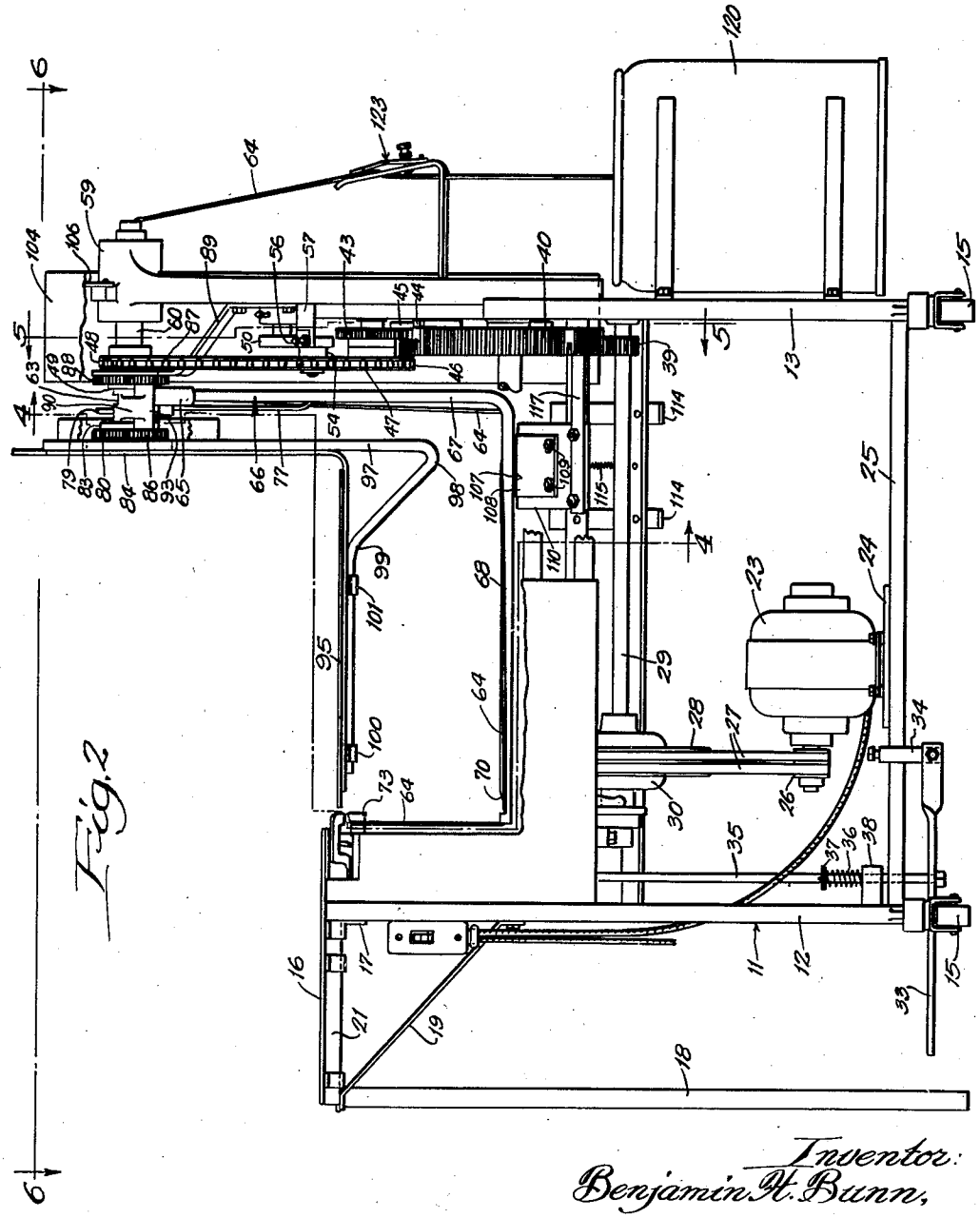


Fig. 2

Inventor:
Benjamin H. Bunn,
By McCaleb, Woodbury & Dickinson
Attorneys.

March 6, 1945. B. H. BUNN 2,371,024

TYING MACHINE

Filed Feb. 10, 1942 6 Sheets-Sheet 3

Fig. 3

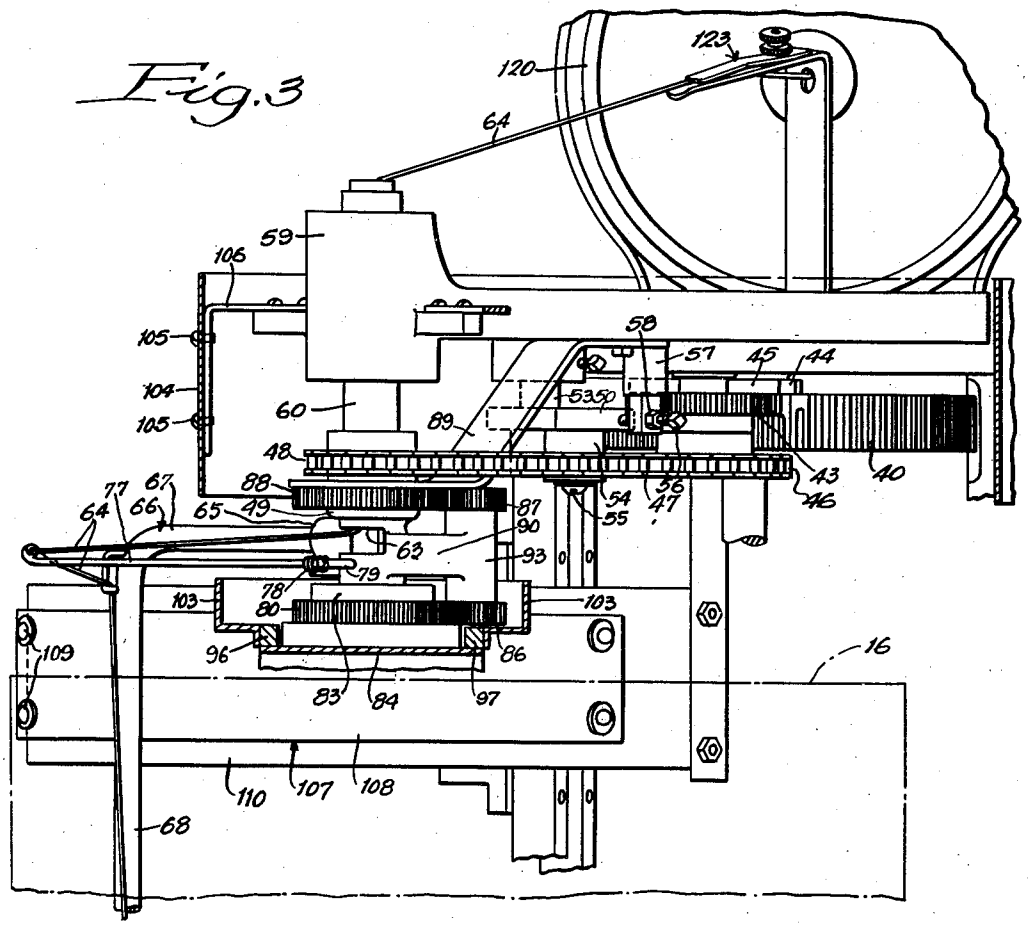
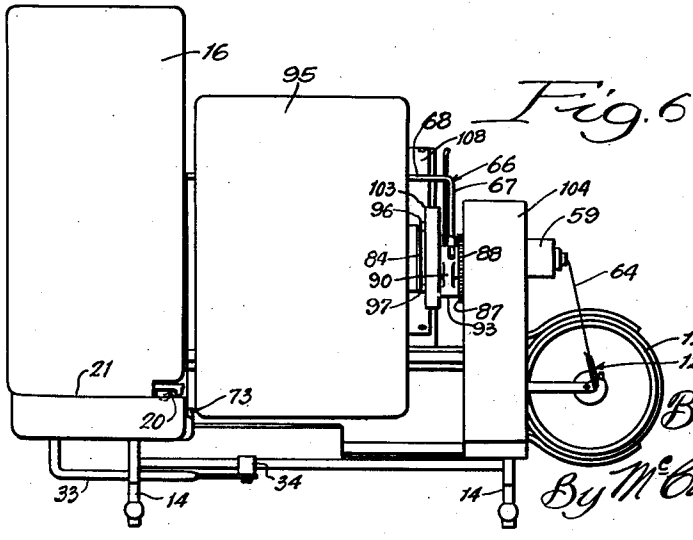


Fig. 6



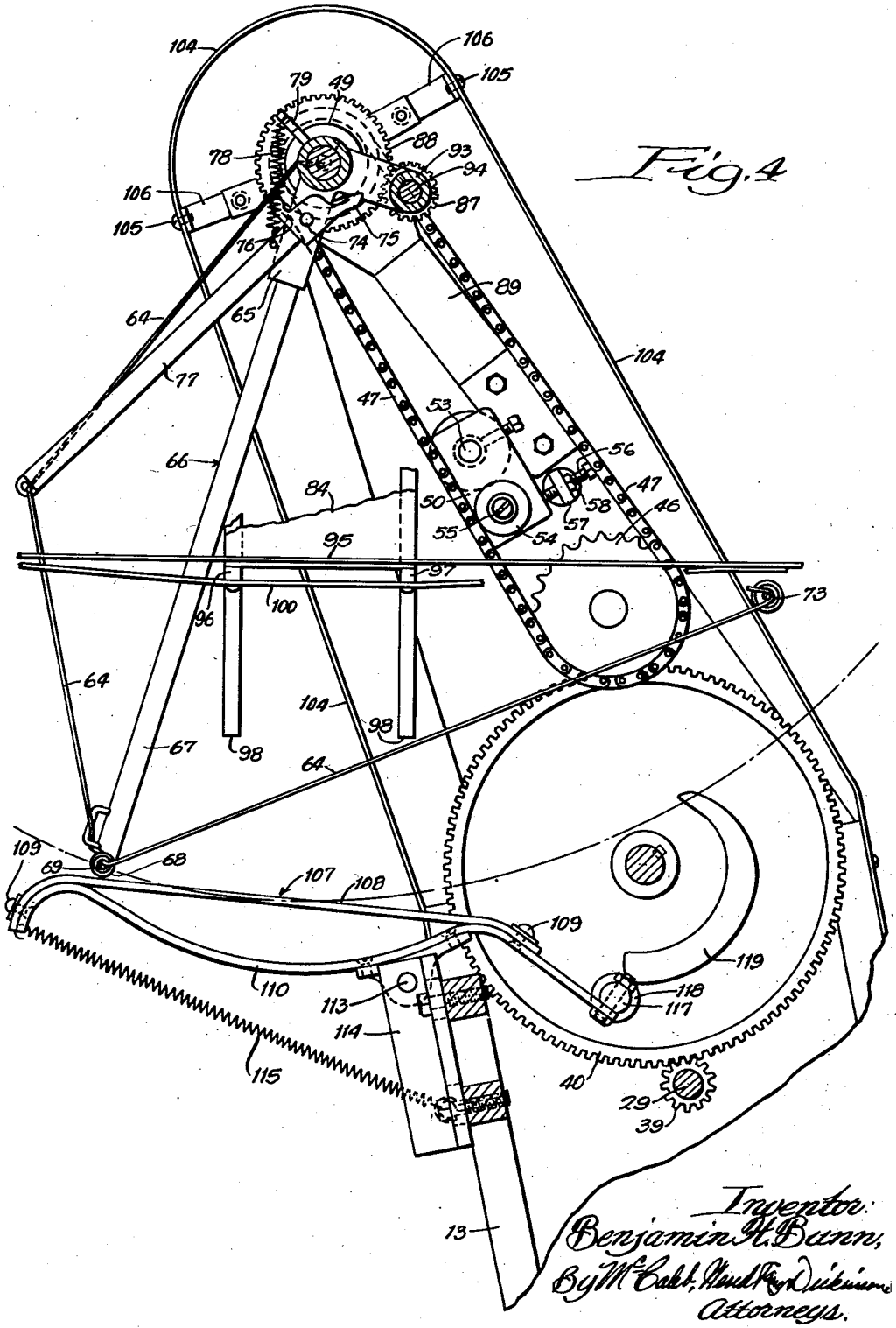
Inventor:
Benjamin H. Bunn,
By McCabe, Hendrickson & Dickinson,
Attorneys.

March 6, 1945. B. H. BUNN 2,371,024

TYING MACHINE

Filed Feb. 10, 1942 6 Sheets-Sheet 4

Fig. 4



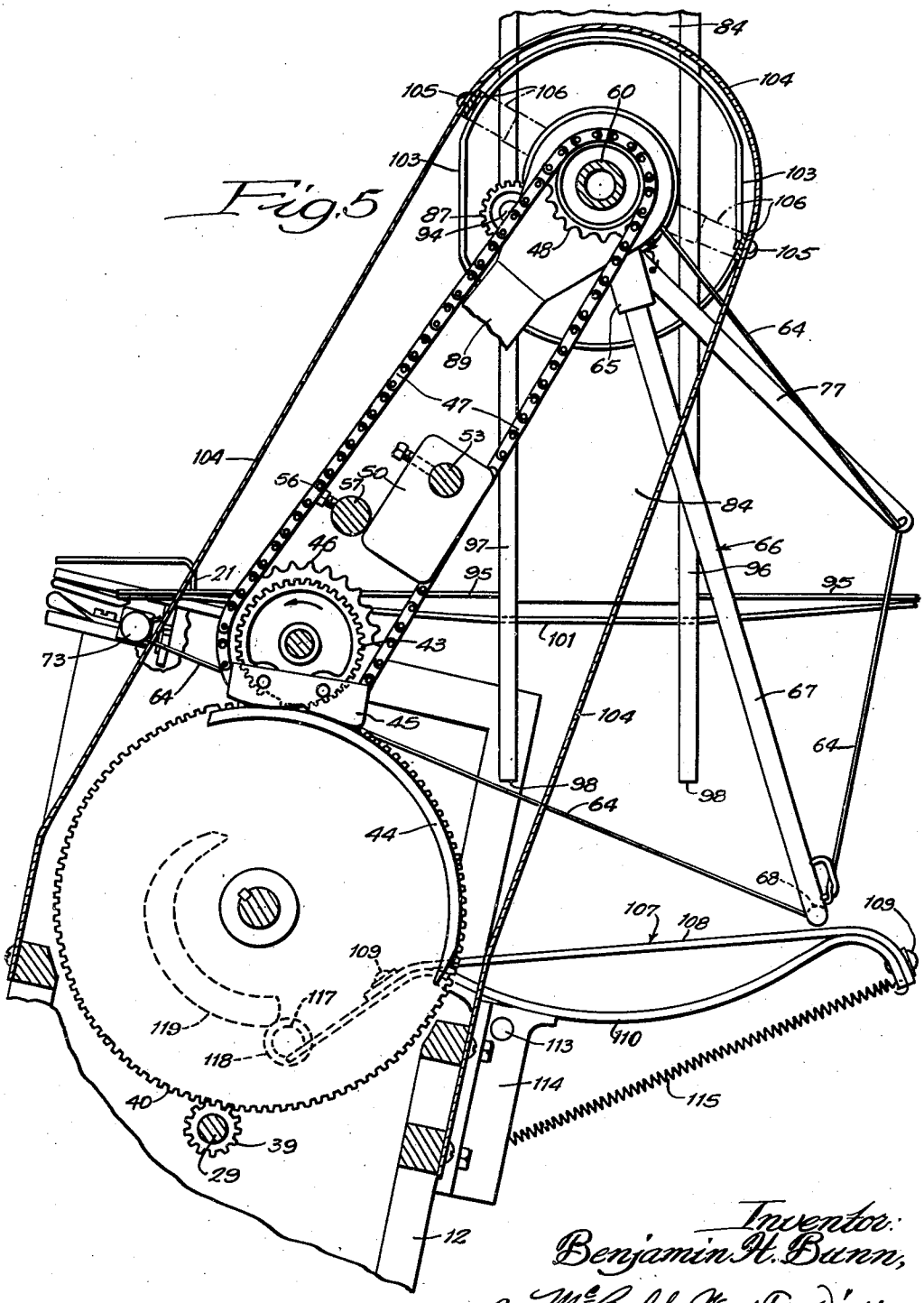
Inventor:
Benjamin H. Bunn,
By McCabe, Hauff & Dickinson
Attorneys.

March 6, 1945. B. H. BUNN 2,371,024

TYING MACHINE

Filed Feb. 10, 1942 6 Sheets-Sheet 5

Fig. 5



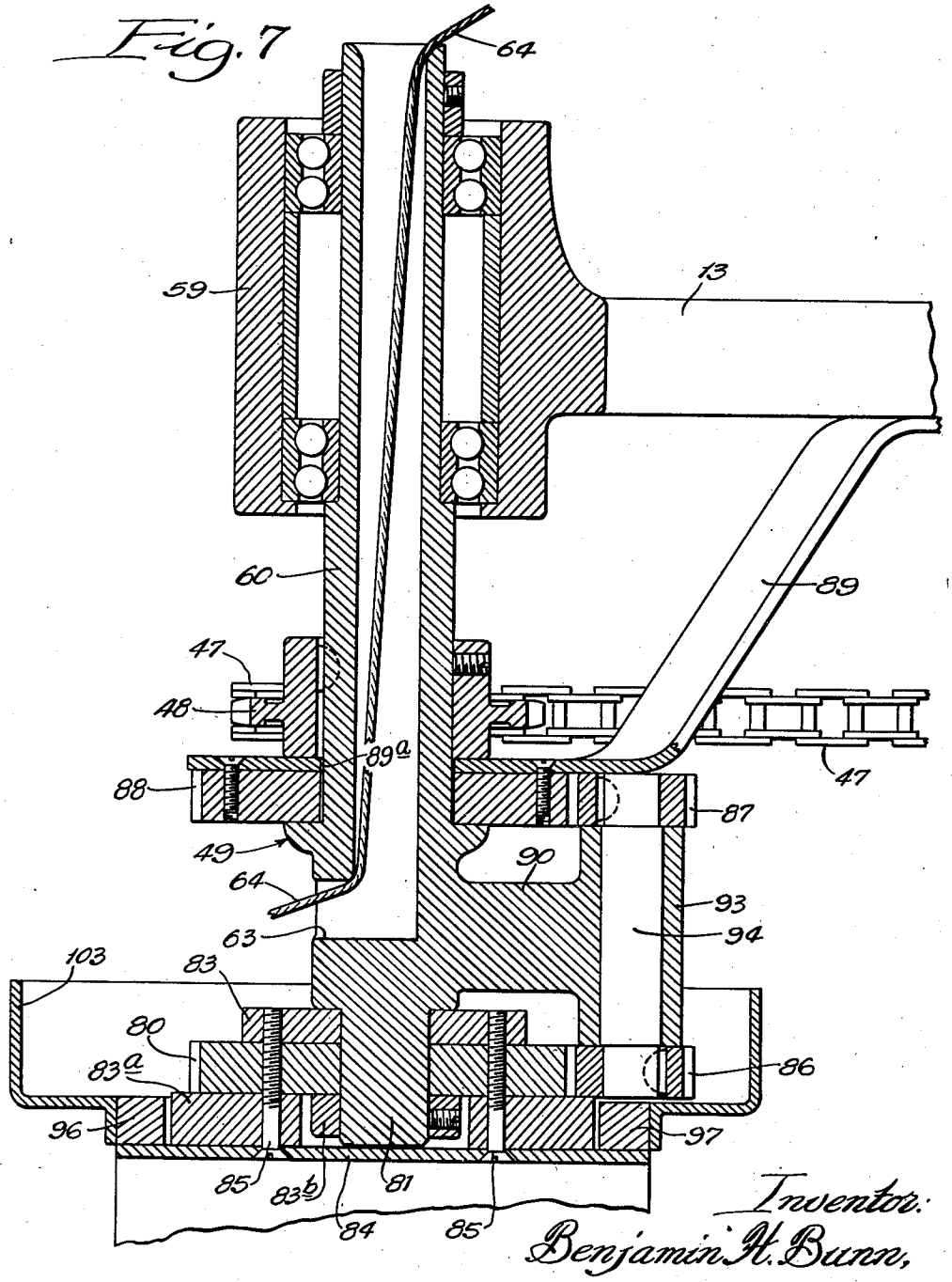
Inventor:
Benjamin H. Bunn,
By McCabe, Hand Fay & Dickinson
Attorneys.

March 6, 1945. B. H. BUNN 2,371,024

TYING MACHINE

Filed Feb. 10, 1942 6 Sheets-Sheet 6

Fig. 7



Inventor:
Benjamin H. Bunn,

By McCaleb, Hendrey & Dickinson
Attorneys.

Patented Mar. 6, 1945 2,371,024

UNITED STATES PATENT OFFICE

2,371,024

TYING MACHINE

Benjamin H. Bunn, Chicago, Ill., assignor to B. H. Bunn Company, Chicago, Ill., a corporation of Illinois

Application February 10, 1942, Serial No. 430,253

7 Claims. (Cl. 100—31)

My present invention relates to tying machines which automatically wrap twine about a package and secure the twine ends together as by knotting them.

Package tying machines of the general type set forth in my Patent No. 1,606,290, dated November 9, 1926, are in widespread use in many industries. In this type of machine a rotating crank-like twine arm is used to carry one or more wraps of twine about a package supported on the machine, the wrapping operations being followed, in direct and automatic sequence, by the knotting together of the ends of the twine wraps, and the severing of the twine.

Machines of the rotating twine arm type in the past have been limited, from a practical standpoint, in the size of package which they were adapted to handle conveniently. Theoretically at least a machine could be built capable of wrapping almost any size package desired. Actually, however, the need for standardization of parts throughout an entire line of machines, together with the necessity for increasing the sizes of the various parts of a machine, in proportion to its increase in capacity, has prohibited the building of machines for wrapping extremely large packages. The net result has been that standard sizes of machines have been adopted, and such machines have been used by their purchasers to wrap the bundles within the limited size range for which they were adapted, and the larger packages were continued to be wrapped by hand.

One object of my invention is to increase the package size capacity of a more or less standard package wrapping machine without enlarging the machine or increasing the radius of the twine arm, and without revising or re-locating the more complicated working parts. This I may accomplish by a simple tilting of the frame of the package tying machine so that the twine arm has a longer sweep from front to back around an island table, pivotally mounted within the sweep of the twine arm.

The various gears, shafts and levers, as well as the twine arm, all have an inertia imparted to them by their movement in a wrapping operation, so that there is a tendency for these parts to overrun at the completion of a wrapping operation. A brake acting on the wrapping arm of a tying machine is illustrated in my copending application, Serial No. 421,735, filed December 5, 1941, and, while such a brake has proven to be of merit with certain types of machines, an improved brake development has been incorporated in my present invention. A further object of my invention is a more positively operated arresting of the movement of the operating parts of a package tying machine upon the completion of each cycle of operation, in such a manner as to leave the parts free for movement at the initiation of each succeeding wrapping operation.

My prior Patent No. 1,606,290 shows the use of an island table, pivotally mounted with respect to the twine arm of a wrapping mechanism, the mechanism being arranged to carry a reach of twine completely around a package lying partially on the island table, and partially on a fixed table supported on the frame laterally adjacent the island table. In the past I have employed various devices such as a stop bracket (Patent No. 1,606,290) and a twine trap (copending application Serial No. 421,735, filed December 5, 1941) to support an island table against pivotal movement about its axis during a twine wrapping operation. These devices are suitable for their purpose, but where a broad island table is employed, and where a heavy package is apt to be placed on the table at one side or the other of its pivotal axis, the torque produced thereby on the pivotal mounting of the island table is apt to cause interference with the free passage of a reach of twine as it is carried around a package, or to bind the side faces of a twine trap member with the possibility of interfering with the proper operation of the machine. A further object of my invention, therefore, is to eliminate any stop, trap, or like impedance in the path of the twine by anchoring the island table of the package tying machine against pivotal movement by means remote from the path of the twine.

These and other objects and advantages of my invention will be set forth in the following description of a specific embodiment thereof, and illustrated in the accompanying drawings.

In the drawings, of which there are six sheets:

Fig. 1 is a view in side elevation of a tying machine embodying the present invention;

Fig. 2 is a view in front elevation of the machine of Fig. 1, a portion of a front plate being broken away to show the twine arm;

Fig. 3 is an enlarged fragmentary section taken on the plane of the line 3—3 of Fig. 1;

Fig. 4 is an enlarged fragmentary section taken on the offset planes of the broken line 4—4 of Fig. 2;

Fig. 5 is an enlarged fragmentary section taken

on the offset planes of the broken line 5—5 of Fig. 2;

Fig. 6 is a reduced plan view of the complete machine; and Fig. 7 is an enlarged sectional detail view through the axis of the twine arm hub member.

Knotting or twine securing mechanism capable of being employed in connection with my present invention, as well as other parts of the present illustrative machine, may be similar to those of the tying machine disclosed in my Patent No. 1,606,290. In order, therefore, to simplify the present specification, the reader is referred to that patent for an understanding of the general structure and operation of the machine, and the present specification will be directed more particularly to the novel features of my present invention.

Referring to the drawings in detail, a frame 11 comprises cast metal end members 12 and 13 provided with rearward extensions 14 for increasing the stability of the machine, the lower ends of these end frames being provided with pivoted casters 15. It will be noted in Fig. 1 that the entire end frame members, with the exception of their extreme lowermost portions, are tilted rearwardly. Thus, it is possible, by a slight modification of the lower portions of the end frames, to construct end frames adapted to the present invention from the same general type of patterns as those used for the straight vertical frames of my prior machines.

A fixed table top 16 of sheet metal is secured to the upper end of the frame 11 as by means of brackets 17, to position this fixed table in a substantially horizontal plane in spite of the rearward tilt of the frame achieved by the lower end support arrangement. The fixed table top 16 is relatively large and extends rearwardly well beyond the rear of the frame 11. This rearwardly extending portion of the table is supported by an auxiliary leg 18 which may be of band steel. The fixed table also extends outwardly to the left well beyond the frame, as illustrated in Fig. 6, and this laterally extending portion is supported by a bracket 19, the lower end of which is bolted to the end frame. The front portion of the fixed table is offset upwardly as at 21 on a line approximately above the knotter beak 20 (Fig. 6) to assist in positioning properly a package mounted on the table for wrapping.

An electric drive motor 23 is mounted on a support plate 24 secured to a transverse lower frame portion 25, and is connected by means of a V-pulley 26 and V-drive belts 27 to a V-pulley 28 which normally is adapted to rotate freely on a clutch shaft 29, the pulley 28 being adapted to be connected by means of a clutch 30 to the clutch shaft 29 upon operation of the clutch.

A clutch control pedal 33 is pivoted on a bracket 34 which is secured to the transverse frame member 25, the clutch pedal having a clutch operating rod 35 connected thereto, and normally held in up-raised inoperative position by a coil compression spring 36 which is held in compression between a collar 37 on the clutch-operating rod 35 and a bracket 38 supported on the end frame member.

A pinion 39 is keyed to the clutch shaft and is in constant meshed engagement with one side of a mutilated gear 40. The mutilated gear, is in general, similar to that of the machine described in my Patent No. 1,606,290, the left-hand portion of the mutilated gear being fully toothed throughout its entire periphery, while the right-hand portion thereof has the teeth cut away for a portion of its circumference. Throughout a portion of each rotation of the mutilated gear 40, the teeth on the right hand side thereof will be in driving engagement with the teeth of a twine arm drive gear 43 which is journaled on the frame 11. During a further portion of such rotation, the twine arm drive gear 43 will be over the untoothed portion of the mutilated gear 40 and therefore will not be driven thereby during such latter portion.

The mutilated gear is provided with a laterally extending flange 44 along the untoothed or mutilated portion thereof, which flange is adapted to support a shoe 45 secured to the side of the twine arm drive gear to hold the twine arm drive gear against rotation during the time the shoe is riding on the flange, and the twine arm drive gear is in registry with the untoothed portion of the mutilated gear.

A chain drive sprocket 46 is secured to the twine arm drive gear to rotate therewith, and is in driving engagement with a chain 47 which also runs over a driven sprocket 48 which is mounted on, and is keyed to a twine arm hub 49.

A tightening arrangement for the drive chain 47 (best illustrated in Figs. 3, 4 and 5) comprises a block 50 pivotally mounted on a stub shaft 53 mounted in an upwardly extending portion of the end frame 13. The pivoted block 50 is mounted laterally adjacent the chain 47, and is provided with a roller 54 which is mounted on a stud 55 secured to the block eccentrically to the shaft 53 to position the roller over, and in rolling contact with the chain. An adjusting screw 56 is mounted in a bracket 57, also secured to the end frame 13, and is adapted to engage the upper surface of the block 50, so that by threading the adjusting screw down in the bracket to increase the pressure on the upper face of the block, the roller 54 will be forced in the direction of the chain, and thus may be used to adjust the chain tension as required. The adjusting screw is held in adjusted position by means of a lock nut 58 which is adapted to be screwed down into engagement with the upper face of the bracket 57.

The twine arm hub 49, to which the driven sprocket 48 is keyed, is journaled in a bearing 59 at the upper end of the end frame 13. The twine arm hub comprises a hollow shaft portion 60 extending through the bearing 59, and through the driven chain sprocket 48, and is provided with a lateral opening 63 therein as best illustrated in Fig. 3 through which the twine 64 is passed.

Adjacent the opening 63 the hub 49 is provided with a socketed extension 65 in which a twine arm 66 is secured. The twine arm has a radially extending portion 67, and is bent at right angles a required distance outwardly from the hub, to provide a horizontal portion 68 having an axial opening 69 in its outer or free end, with a lateral opening 70 providing access to this axial opening. The outer end of the twine arm is in the same plane vertically as a twine catcher 73.

A twine slack take-up member comprises a base portion 74 pivoted to the twine arm, and having a pair of angularly extending fingers 75 and 76 to limit its rotative movement. A metal strip 77 is mounted on the pivoted base 74, and has an opening in its outer end adapted to receive the twine. A coil spring 78 is held in tension between the twine arm and a pin 79, car-

ried by the hub 49 which tends to urge the slack takeup arm in a clockwise direction from the position illustrated in Fig. 4 to exert a resilient tension on the twine and thereby takes up any slack which may occur.

An island table anchoring gear 80 is journaled for free rotation on the outer end 81 of the twine arm hub 49 (Figs. 2, 3 and 7), this gear being secured between spacer plates 83 and 83a and held in place by a retaining collar 83b. The plates and the interposed gear are secured together and to a metal strip 84 constituting a portion of the island table support, by screws 85 (Figs. 1 and 7).

In order to anchor the gear 80, and through it the island table, against rotation, the gear 80 is connected through a pair of coaxial gears 86 and 87 to a fixed gear 88 of the same diameter and tooth size as the gear 80, the fixed gear 88 being secured to a bracket 89 which in turn is bolted to the end frame 13. The bracket 89 is provided with an opening 89a (Fig. 7) in its outer or gear supporting end to receive the hub 49 for free rotation therein, as is likewise the fixed gear 88, so that the hub 49 may rotate freely and without interference within the openings in this bracket and the fixed gear 88.

An arm 90 may be cast integrally with the hub 49 to extend radially therefrom, as illustrated in Fig. 3, the arm 90 having a transverse bearing 93 at its outer end in which a shaft 94 (see Fig. 4) is journaled to lie parallel to the axis of the hub 49. The shaft 94 has the pair of co-axial gears 86 and 87 keyed one to each end thereof, these gears being alike, and, respectively, in meshed engagement with the gears 80 and 88. The interconnected pair of co-axial gears are carried bodily around the fixed gear 88 and the island table support gear 80 to produce a relatively reverse drive effect of one to one ratio between the fixed gear and the island table gear and thereby prevent relative rotation between these gears. This arrangement permits free rotation of the hub 49 and its supported parts, at the same time preventing any pivotal movement of the island table.

The strip 84 secured to the island table support plate 83 extends vertically downwardly to the desired level of an island table top 95 and there it is bent at right angles and extends horizontally substantially the entire width of the island table top.

A pair of rectangular metal rods 96 and 97 are secured, one to each side of the outer, or right-hand face of the vertical portion of the strip 84, and extend downwardly well below the right-angle bend in this strip, as illustrated in Fig. 2. These rods are bent angularly upward as at 98 to the level of the underside of the island table top, where they again are bent, as at 99, to extend horizontally under the top of the island table.

A pair of metal reinforcing straps 100 and 101 are secured to the underside of the island table, as best illustrated in Figs. 1 and 2. The central portions of these straps are secured to the under sides of the rectangular rods 96 and 97 which hold the center portions of the straps spaced downwardly from the table top, while the ends of the straps are secured to the underside of the table top. This arrangement forms a truss which adds greatly to the strength and rigidity of the island table.

It will be noted in Fig. 1, that the tilting of the frame, while maintaining the fixed and island tables horizontal, causes the common plane of these tables to subtend a materially larger arc of the cylinder defined by the sweep of the twine arm, indicated by the dash-and-dot circle X, than is the case with a twine arm of the same radius of swing, but mounted on a normal or upright frame, and with the tables horizontal with the upright frame arrangement. Such relative positioning of the tables with respect to an upright frame is indicated by the dash-and-two-dot line Y—Y of Fig. 1.

A pair of flanged shields 103 are mounted, one on each side of the island table support plate and rectangular rod assembly, to enclose the sides of the island table anchoring gear 80, as best illustrated in Figs. 1 and 3. A sheet metal safety guard member 104 also is secured by screws 105 to brackets 106 on the end frame 13 to enclose the mechanism on the end frame 13.

A twine supply bucket 120 is mounted at one end of the frame, and a spring controlled twine tensioning device 123 is mounted on the frame to control the tension on the twine 64 as it is led into the hollow hub 49 of the twine arm.

Fig. 1 shows the twine arm 66 in its normal or "at-rest" position, having just been released from engagement by a brake 107. The brake comprises a flexible friction member 108 which may be a leather strap secured at its ends by rivets 109 to subtend an arcuately bowed metal frame member 110. The frame member is pivoted as at 113 to brackets 114 secured to the frame, and the outer or rear end of the brake member 110 is connected by means of a tension spring 115 to the frame 11, normally to urge the brake in a direction of counterclockwise rotation from the position illustrated in Fig. 1.

The forward end of the brake member 110 extends well forwardly from the pivot 113, as illustrated in Fig. 4, and is provided with a rod 117 secured to extend parallel to the pivotal axis of the brake. This rod carries at its inner end a cam roller 118 which extends into the path of movement of a cam 119 secured to a side of the mutilated gear 40.

The driving arrangement of the illustrated machine is intended to produce three successive rotations of the twine arm during each complete cycle of operation of the machine. The cam 119 is positioned to engage the cam roller 118 and move the brake 107 up into operative position as illustrated in Fig. 4 during the third or last rotation of the twine arm in each cycle, and to release the brake from its operative position just prior to the point at which the twine arm drive is released by the arrival of the twine arm drive gear 43 over the untoothed portion of the mutilated gear 40. This action releases the brake and frees the twine arm for unobstructed movement upon the initiation of each succeeding wrapping operation.

While I have illustrated a preferred embodiment of my invention, many modifications may be made without departing from the spirit of the invention, and I do not wish to be limited to the precise details of construction set forth, but desire to avail myself of all changes within the scope of the appended claims.

I claim:

1. A package tying machine comprising in combination with a frame, a package support mounted on the frame, a bearing carried by the frame above and at one side of the package support, a twine arm hub journaled in the bearing, a twine arm mounted on the hub, an island table

pivotally suspended with respect to the twine arm hub, a fixed anchor member carried by the frame and mounted in axial alignment with the hub beyond the twine arm, and means caried by the hub and having inter-engagement with the fixed anchor member and the island table to anchor the table against pivotal movement during a rotation of the hub and its supported twine arm.

2. A package tying machine comprising in combination with a frame, a package support mounted on the frame, a bearing carried by the frame above and at one side of the package support, a twine arm hub journaled in the bearing, a twine arm mounted on the hub, and an island table pivotally suspended with respect to the twine arm hub; a fixed gear mounted on the frame co-axially with the hub beyond the twine arm, a second gear secured to the island table, and gear means carried by the hub and having meshed engagement with the fixed gear and with the island table gear to anchor the island table against pivotal movement on rotation of the hub.

3. A package tying machine comprising in combination with a frame, a package support mounted on the frame, a bearing carried by the frame above and at one side of the package support, a twine arm hub including a shaft journaled in the bearing, a twine arm mounted on the hub, an island table pivotally suspended on the twine arm hub, a fixed gear mounted on the frame co-axially with but independently of the hub beyond the twine arm, a second gear secured to the island table in coaxial relation to the fixed gear, a bearing carried by the hub eccentrically thereof, the axis of the bearing being substantially parallel to the axis of the hub, a shaft pivoted in the latter bearing, and a pair of coaxial gears affixed to the shaft and having toothed engagement with the fixed gear and with the island table gear to anchor the island table against pivotal movement on rotation of the hub and its supported parts.

4. A package tying machine comprising in combination with a frame, a package support mounted on the frame, a bearing carried by the frame above and at one side of the package support, a twine arm hub journaled in the bearing, a twine arm mounted on the hub, and an island table pivotally suspended with respect to the twine arm hub; a fixed gear mounted on the frame co-axially with the hub, a second gear mounted on the island table co-axially with the fixed gear, and a pair of operatively interconnected planetary gears carried by the hub eccentrically to its axis, said gears being in mesh, one with the fixed, and one with the island table gear, respectively to anchor the island table against pivotal movement on rotation of the hub.

5. A package tying machine comprising in combination with a frame, a package support mounted on the frame, a bearing carried by the frame above and at one side of the package support, a twine arm hub journaled in the bearing, a twine arm mounted on the hub, and an island table pivotally suspended with respect to the twine arm hub; a fixed gear mounted on the frame, a second gear mounted on the island table co-axially with the fixed gear, and interconnected gear means carried by the hub and in mesh with the fixed gear and with the island table gear, respectively, to be actuated on a rotation of the hub to produce a relatively reverse drive effect of one to one ratio between the fixed gear and the island table gear, whereby the relative rotation of the hub supported interconnected gear-means produces a resultant zero rotation of the island table gear with respect to the fixed gear.

6. In combination in a tying machine, a supporting frame structure, a fixed table carried by said frame structure for partially supporting a package to be tied, the package extending for this purpose beyond one edge of the table, a crank type twine arm pivoted on the frame and adapted to rotate to carry its free end in an orbit adjacent to said edge of the fixed table to lay a wrap of twine about the package, an island supporting structure pivotally supported on the axis of rotation of the twine arm and extending within the orbit of the arm adjacent to but spaced from the fixed table edge for additionally supporting the package, the twine arm being adapted to pass entirely about the island supporting structure in describing the twine laying orbit, and mechanism for anchoring the island supporting structure in stationary position relative to the fixed table comprising means mounted in stationary relation to the fixed table and means movable relative to the fixed table during the rotation of the twine arm but cooperating with said stationary means for maintaining the island supporting structure at all times in said stationary position.

7. In combination in a tying machine, a supporting frame structure, a fixed table carried by said frame structure for partially supporting a package to be tied and extending beyond one edge of the table, a crank type twine arm pivoted on the frame and adapted to rotate to carry its free end in an orbit adjacent to said edge of the fixed table to lay a wrap of twine about the package, an island supporting structure pivotally supported on the axis of rotation of the twine arm and extending within the orbit of the arm adjacent to but spaced from the edge of the fixed table for additionally supporting the package, and mechanism for anchoring the island supporting structure in stationary position relative to the fixed table comprising an element fixedly associated with the island supporting structure and means interengaging with different points of said element in the course of every cycle of rotation of the twine arm and constantly cooperating with said element to maintain the island supporting structure constantly in said stationary position.

BENJAMIN H. BUNN.