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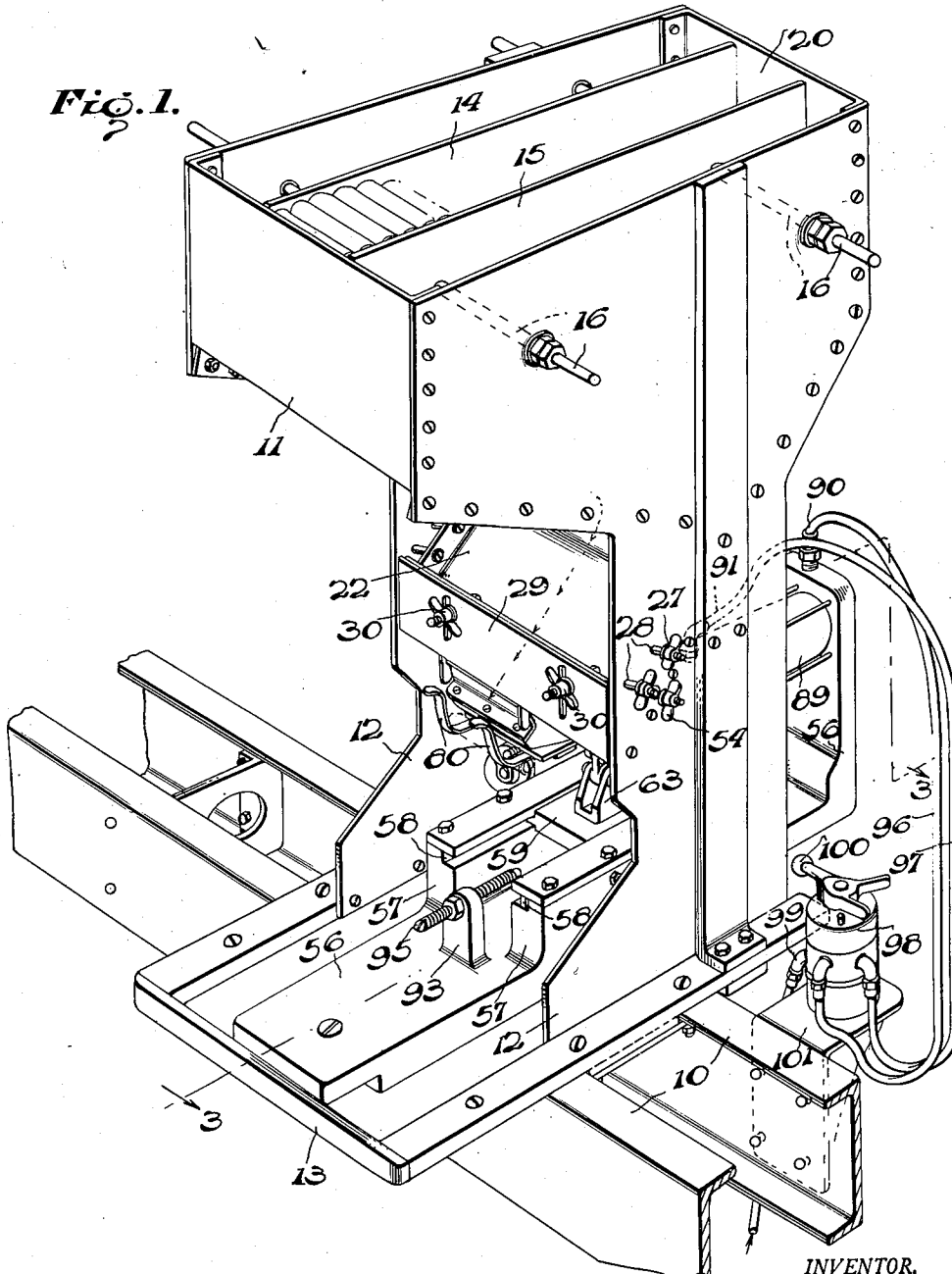
J. A. KASERMAN

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FEED HOPPER AND FEED MECHANISM

Filed Oct. 16, 1946

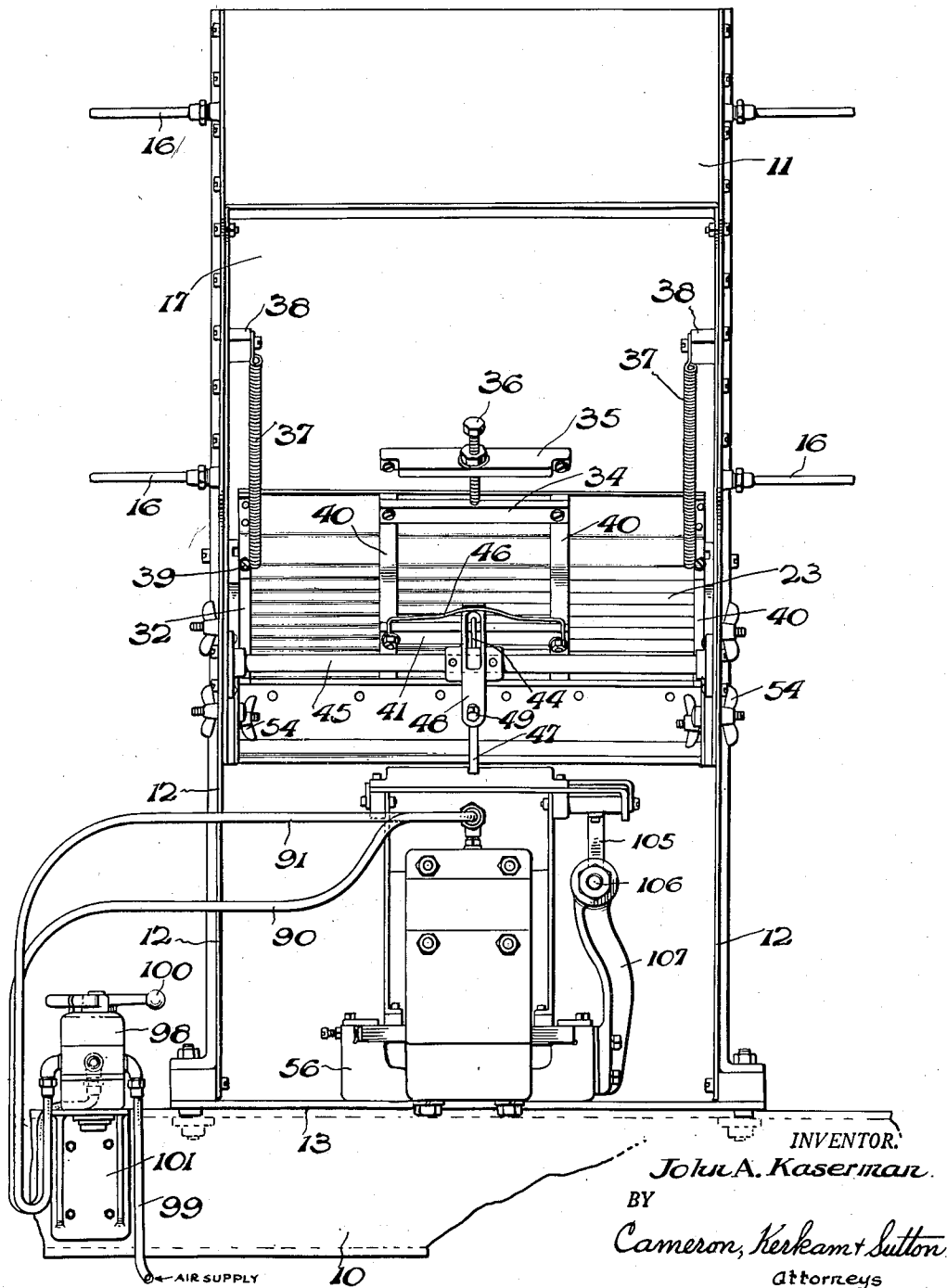
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FIG. 2.



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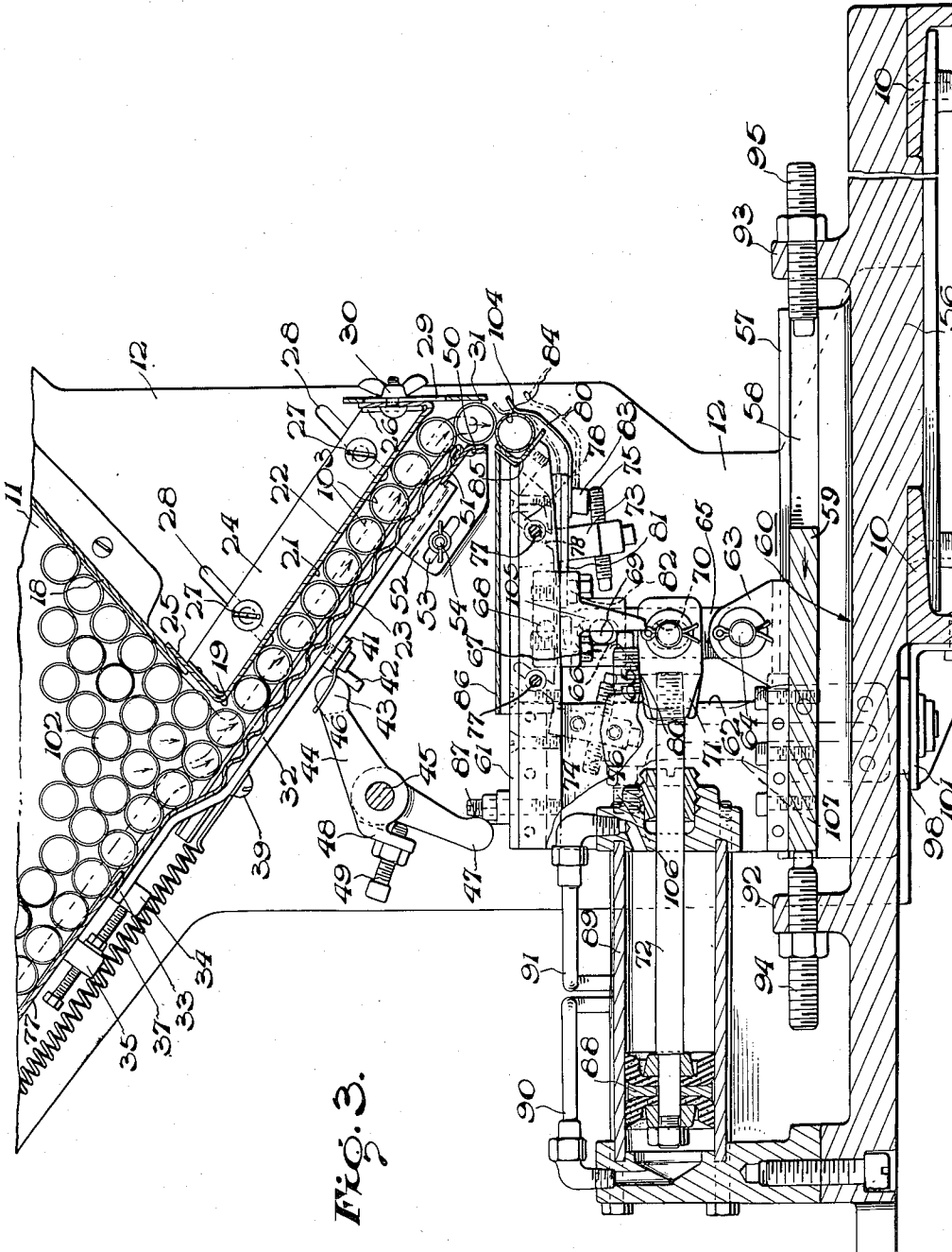
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2,584,466

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Filed Oct. 16, 1946

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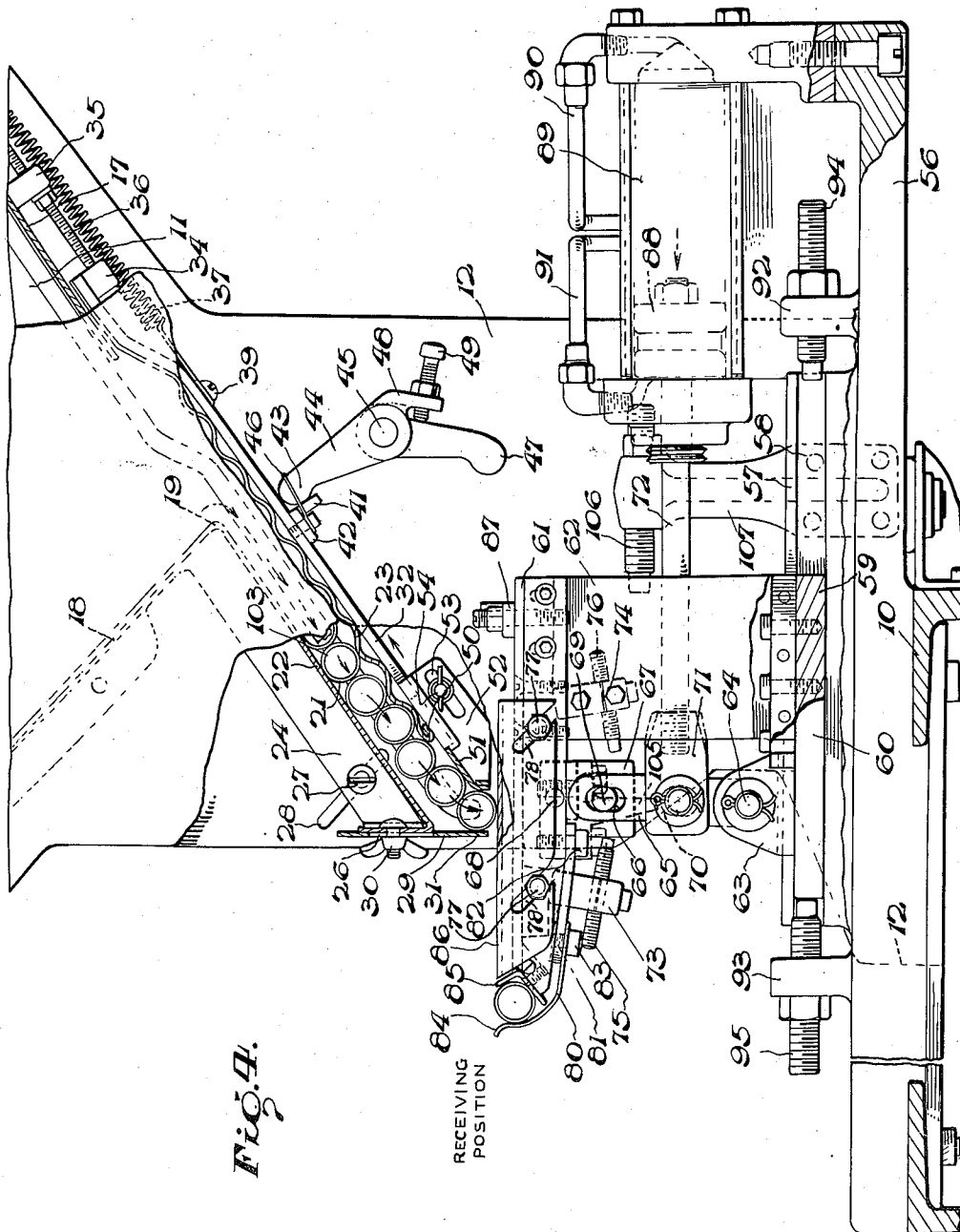
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2,584,466

FEED HOPPER AND FEED MECHANISM

Filed Oct. 16, 1946

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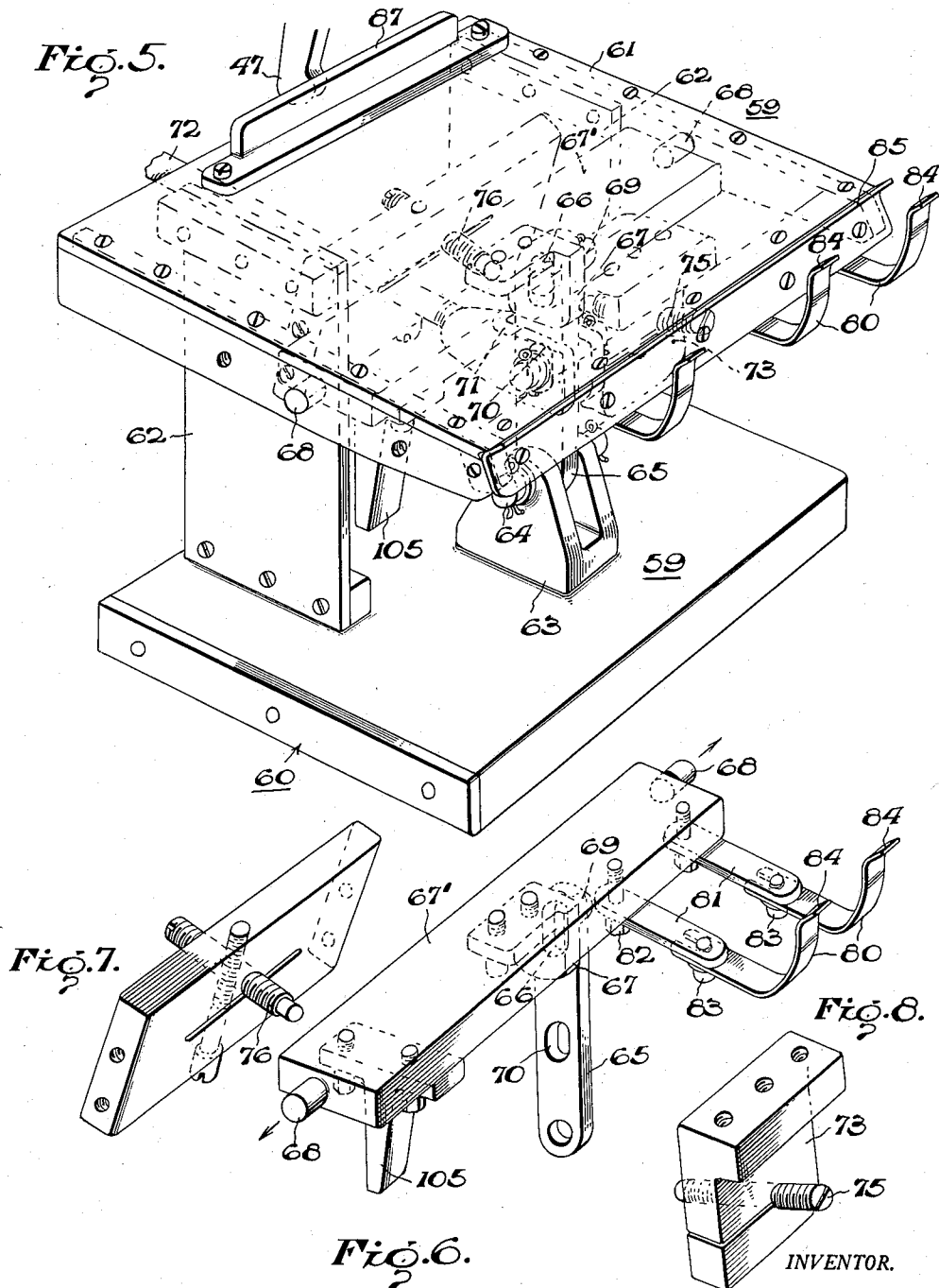
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2,584,466

FEED HOPPER AND FEED MECHANISM

Filed Oct. 16, 1946

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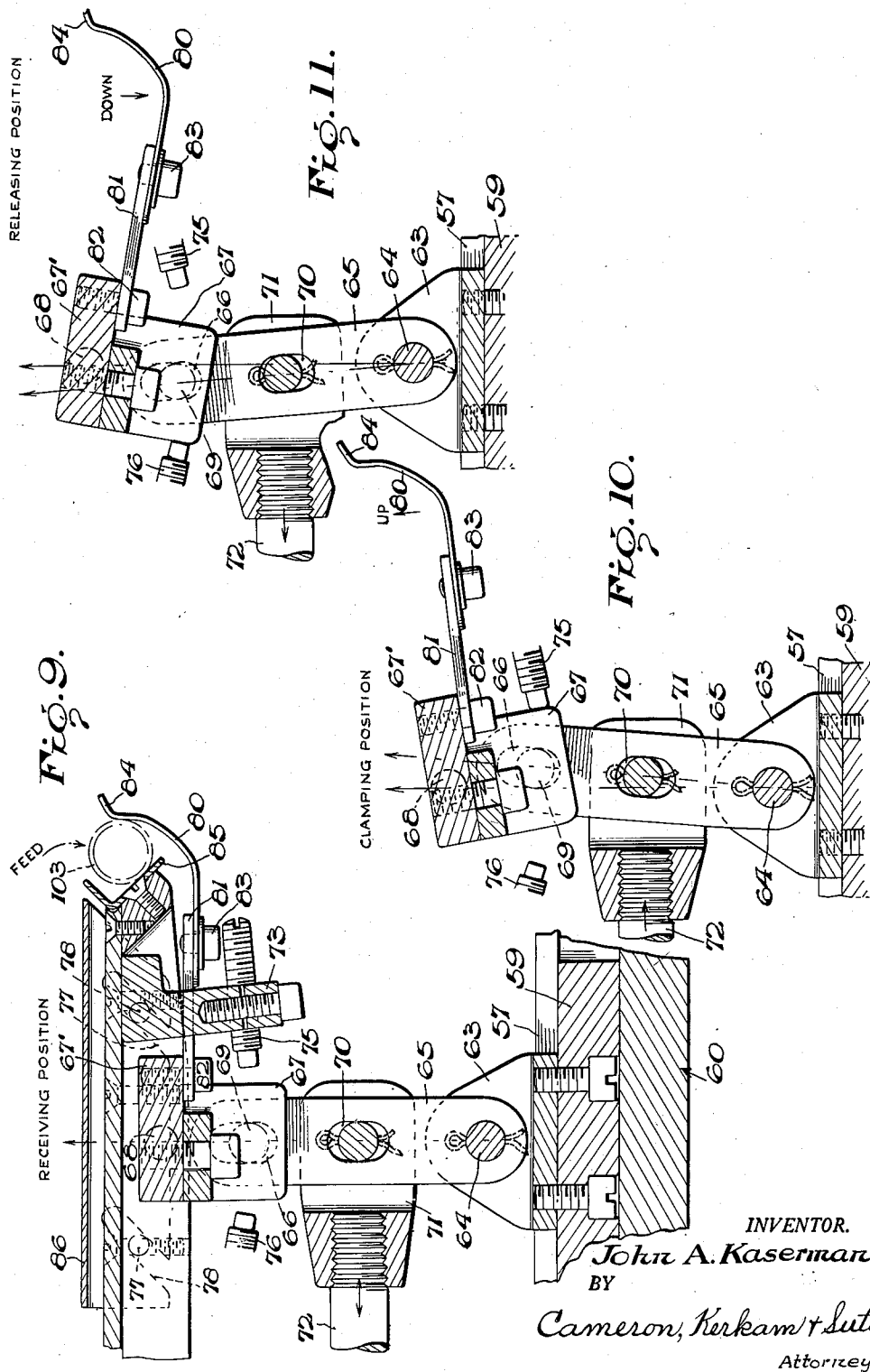
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2,584,466

FEED HOPPER AND FEED MECHANISM

Filed Oct. 16, 1946

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UNITED STATES PATENT OFFICE

2,584,466

FEED HOPPER AND FEED MECHANISM

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Application October 16, 1946, Serial No. 703,686

10 Claims. (Cl. 214—1)

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This invention relates to tube feeding mechanism, and more particularly to hopper mechanism and mechanism for transporting tubes one at a time from said hopper mechanism to any suitable machine for operating on the tubes. The present invention is particularly adapted for handling relatively thin tubes such as are used in the manufacture of expansible and collapsible corrugated tubular metal walls or bellows, but as will be apparent from the ensuing disclosure it can be readily applied to the feeding of tubes to an automatic tube-drawing machine as well as to other machines for performing appropriate operations on tubes.

It is an object of the present invention to provide an improved device of the type characterized which is of simple construction, certain in operation and capable of efficiently performing its desired functions automatically and expeditiously.

Another object of this invention is to provide an improved device of the type characterized wherein the movement of a single member successively effects the firm gripping of the tube and thereafter transports the tube to the position at which it is to be delivered.

Another object of this invention is to provide an improved device of the type characterized which through the operation of a single member effects transportation of the tubes one at a time to a delivery position and thereafter assures the release of the tube before the transporting mechanism is returned to tube-receiving position.

Another object of this invention is to provide a device of the type characterized which includes improved mechanism for assuring that the tube shall be delivered from a hopper to a transporting mechanism at the desired rate and in the desired position.

Another object of this invention is to provide a device of the type characterized with improved means for gripping a tube delivered to the transporting mechanism and holding it firmly during transportation and thereafter releasing it without danger of injuring the tube even though it may be formed of relatively thin metal.

Another object of this invention is to provide an improved device of the type characterized which may be readily adjusted to handle tubes of different diameter or different length or both.

Other objects of the invention will appear as the description of the invention thereof proceeds.

The invention is capable of receiving a variety of mechanical expressions only one of which

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is shown on the accompanying drawings, and it is therefore to be expressly understood that the drawings are for purposes of illustration only and are not to be construed as definitions of the limits of the invention, reference being had to the appended claims for that purpose.

Referring in detail to the accompanying drawings wherein the same reference characters are employed to designate corresponding parts in the several figures,

Fig. 1 is a perspective elevation of a structure embodying the present invention;

Fig. 2 is a rear elevation of the structure shown in Fig. 1;

Fig. 3 is an elevation, partly broken away and partly in section, taken approximately on the line 3—3 of Fig. 1 to illustrate certain details of construction;

Fig. 4 is a view corresponding to Fig. 3 but viewed from the opposite side of the structure of Fig. 1 and illustrating the position of the parts at the opposite extremity of the movement of the transporting mechanism from that shown in Fig. 3;

Fig. 5 is a perspective view of the carriage;

Figs. 6, 7 and 8 are perspective views of parts carried by but detached from the carriage; and

Figs. 9, 10 and 11 are fragmentary sections of the carriage to illustrate the relative positions of the finger actuating members at different portions of the cycle of operation of the carriage.

In a machine for manufacturing bellows as heretofore referred to, the tubes to be corrugated are to be removed from a suitable hopper and transported to a position wherein the opposite extremities of the tube are gripped between members of the corrugating mechanism, which position is herein referred to as the delivery position for the tube, after which the tube is subjected to appropriate corrugating operations in a manner well understood in the art. The present invention is suitable for embodiment in a mechanism which may be mounted on the frame 10 of the corrugating machine, the elements of the corrugating machine having been omitted for the sake of clearness.

In the form shown the tubes to be corrugated are stored in a hopper 11 of any suitable size, construction and material and shown as carried by opposed plate like uprights 12 which may be extensions of the side plates of the hopper 11 and which are suitably secured to a base member 13, as by bolts, said base member in turn being secured to the framework 10 in any suitable way. As illustrated, the body of the hopper is approxi-

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mately rectangular in horizontal section and has within the same a pair of partition members 14 and 15 movably mounted in any suitable way, as on transverse rods 16, so that they may be relatively adjusted toward and from each other to conform the width of the intermediate chamber 20 approximately to the length of the tubes to be operated upon. The bottom of the hopper 11 has oppositely disposed downwardly inclined walls 17 and 18 leading to a throat 19 through which the tubes stacked upon each other in the central compartment 20 may move by gravity to the mechanism next to be described.

From the throat 19 the tubes move through a downwardly inclined chute 21 having a stationary but adjustable upper wall 22, a rectilinearly movable and preferably corrugated lower wall 23, and suitable side walls which may be mounted on or be formed by the uprights 12. Preferably the side walls of the chute may be adjusted toward and from each other between the top and bottom walls by the adjusting screws hereafter referred to, or by other suitable means, so that they are aligned with the partitions 14 and 15. Upper wall 22 is provided with opposed upwardly extending side flanges 24 and upwardly extending end flanges 25 and 26. Each flange 24 is adjustably mounted on its upright 12 in any suitable way, as by thumb screws or the like 27 carried by the flange 24 and slidable in slots 28 provided in said upright, so that the top wall 22 of the chute may be made to approach or recede from the bottom wall 23 to conform the dimension between said walls approximately to the diameter of the particular tubes being handled, after which the upper wall 22 may be locked rigidly in position. Flange 25 at the upper extremity of the top wall 22 is in overlapping relationship to the inclined bottom wall 18 of the hopper, as shown in Fig. 3, so that in all of its positions of adjustment no gap exists between the lower edge of the wall 18 and the upper edge of the flange 25. Flange 26 carries a depending apron 29, and either the flange or the apron is slotted while the other of said parts carries suitable locking means, such as thumb screws or the like 30, to the end that said apron 29 may be adjusted up and down to predetermine the size of the outlet 31 of the chute 21 to conform appropriately with the size of the tubes being handled.

The bottom wall 23 of chute 21, as before referred to, is preferably corrugated so as to provide a positive feed of the tubes thereon, if required to keep the chute full of tubes, when said wall is reciprocated in its own plane. Wall 23 at its opposite sides has longitudinally extending bars 32 suitably attached thereto, and it overlaps the lower extremity of the bottom wall 17 of the hopper as shown at 33, the extent of such overlap being such that in the extreme forward feeding movement of the bottom wall 23 as hereinafter explained no gap is introduced between the lower extremity of the bottom wall 17 and the upper extremity of the reciprocating wall 23. Wall 23 also carries a pair of intermediate bars 40 which are connected at their upper extremities by a cross bar 34 and at their lower extremities by a cross bar 41. The bottom wall 17 of the hopper has mounted thereon in any suitable way a cross bar 35 in which is disposed an adjustable stop screw 36 adapted to engage the cross bar 34 and thereby predetermine the upper limit of movement of the bottom wall 23. Bottom wall 23 is normally urged to the upper limit of its range of movement by a pair of coil springs 37 suitably at-

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tached at one end, as by lugs 38, to the uprights 12 and suitably attached at their opposite ends, as by screws 39, to the side bars 32. To move the bottom wall 23 against the tension of the springs 37 and away from the stop screw 36, the cross bar 41 carries a downwardly depending L-shaped lug 42 with which cooperates the head 43 of a lever 44 mounted on a transverse rod 45, the head 43 of said lever being yieldably held in contact with the lug 42 by a transversely extending spring 46. The opposite end of lever 44 is in the form of a depending bracket 48 which carries an adjustable set screw 49 or the like, and rotatably mounted on said rod 45 is a depending arm 47 adapted to engage set screw 49 and move lever 44 in a clockwise direction, as viewed in Fig. 3, to actuate the lug 42 and move the bottom wall 23 toward the mouth of the chute 21. The lower end of wall 23 overlies at 50 the upper face of an adjustable mouthpiece 51 which cooperates with the apron 29 in predetermining the size of the outlet from the chute 21. As shown, the mouthpiece 51 has side flanges 52 slotted at 53 and adjustably mounted, as by wing nuts 54 or the like, on the uprights 12, so that by moving the mouthpiece 51 in one direction or the other lengthwise of the slots 53 the mouthpiece may be set to conform the fore and aft dimension of the outlet 31 appropriately with the diameters of the tubes to be handled.

The tubes to be operated upon are delivered one at a time through the mouth or outlet 31 to a transporting mechanism which carries the tubes, one at a time, to the delivery position as heretofore referred to. To this end the base member 13, in the form shown, carries a plate 56 integral therewith or suitably attached thereto from which projects upwardly a pair of longitudinal members 57 constructed in any suitable way to provide ways 58. Slidably mounted in said ways 58 is a carriage 59, comprising a base portion 60, a top portion 61 and side members 62 rigidly connecting said base and top portions into a rigid unit.

Base portion 60 is provided in any suitable way at about its median plane with an upwardly extending lug or lugs 63 on which is pivotally mounted at 64 a link 65. The upper end of link 65 is slotted, as shown at 66, and received within a block 67 depending from a plate-like member 67' that is pivotally mounted on the top portion of the carriage, as by eccentric pins 68, block 67 carrying a pin 69 which works in the slot 66. Link 65 has pivotally connected thereto at slot 70 a second block 71 to which is connected in any suitable way the mechanism for moving the carriage 59, here shown as a piston rod 72 of hydraulic mechanism to be referred to. The upper portion 61 of carriage 59 has rigidly attached thereto at opposite sides of the block 67 depending lugs 73 and 74 which carry adjustable stop screws 75 and 76 respectively. Block 67 also carries a depending stop member 105 adapted to engage an adjustable stop screw 106, carried by bracket 107, when the carriage 59 is in tube receiving position for properly positioning said block 67 and the fingers carried thereby, as hereinafter explained.

Plate 67' is provided with any suitable number of resilient gripping fingers 80, two being shown, and said fingers are mounted on said plate 67' in any suitable way, as by attachment to transversely extending arms 81 which in turn are attached to the plate 67' by bolts or screws 82. The attachment of the fingers 80 to the arms

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81 is preferably such as to provide for various positioning of the fingers 80, and to this end the arms 81 are provided with apertures, the ends of the fingers are slotted and screws or the like 83 are positionable variously in said slots and apertures, so that the fingers can be adjusted in position. Also, if desired, additional fingers may be attached to the plates 67' if two are not considered sufficient. As shown more particularly in Figs. 3 and 4, the free ends of the fingers 80 are bent upwardly and then outwardly as shown at 84 and their free ends are in position for gripping a tube received in an L-shaped saddle member 85 extending transversely between the side members of carriage 59. In horizontal alignment with the upper edge of saddle member 85 carriage 59 is provided with a member 86 extending lengthwise of the carriage and having a flat upper surface so related to the mouth 31 of the chute 21 that, while the carriage is out of its tube receiving position shown in Fig. 3, said member 86 will act as a shield opposite the mouth of the chute and prevent escape of tubes as hereinafter explained. Member 86 has downwardly extending flanges at the sides thereof each of which flange is provided with two diagonally extending slots, one of which is shown at 78, receiving bolts 77 on the carriage 59, so as to provide adjustment for said member 86 to provide proper support for the tubes in chute 21, said bolts 77 when tightened locking the member 86 rigidly in position. The upper portion of carriage 59 is also provided in any suitable way with an upstanding lug 87 suitably attached to the top portion 61 of the carriage, said lug 87 being so disposed in a fore and aft plane that it will cooperate with the depending arm 47 previously described.

Piston rod 72 is connected in any suitable way with a plunger 88 mounted in a hydraulic cylinder 89 provided with suitable conduits 90 and 91 for leading hydraulic fluid to the opposite extremities of said cylinder. In order to prevent the carriage being moved by the hydraulic cylinder beyond predetermined extreme positions the plate 56 is provided in any suitable way with upstanding lugs 92 and 93 in which are adjustably received stop screws 94 and 95 for engagement with the carriage 59 when the latter has reached the opposite extremities of its desired range of operation. Any suitable control for the hydraulic mechanism may be provided, said hydraulic mechanism preferably being appropriately tied into the control of the corrugating or other machine with which the feeding mechanism is associated so that by operation of a single control member the entire sequence of operation of the machine is initiated. As shown, the conduits 90 and 91 are suitably connected by pipes 96 and 97 to a control valve at 98 provided with hydraulic fluid from any suitable source through conduit 99 and having a control handle 100 by which the hydraulic fluid can be admitted to one or the other ends of the hydraulic cylinder 89. Control valve 98 is mounted in any suitable way on the frame of the machine as by a bracket 101.

In operation the tubes to be handled are stacked in the chamber 20 between the adjustable partitions 14 and 15 as indicated at 102 in Fig. 3, partitions 14 and 15 being adjusted if necessary to approximately conform with the length of the tubes to be handled. The tubes in said chamber 20 will descend by gravity into the chute 21, as shown at 103 in Fig. 3, filling the chute to its mouth and, if the parts are in the

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position shown in Fig. 3, the endmost tube will drop into the seat afforded by the saddle member 85, between said saddle member and the spring fingers 80 which are held in their intermediate position, as shown in solid lines in Fig. 3 and in Fig. 9, by the engagement of stop member 105 with stop screw 106, so that the tube received by the saddle member cannot escape over the ends of the fingers.

If the machine is now to be started the operator manipulates the handle 100 of the control valve 98 so as to admit hydraulic fluid through the pipe 90 to the left-hand end of the cylinder 89 as viewed in Fig. 3. Thereby the piston 88 is moved to the right as shown in Fig. 3. The first movement of the piston 88, through its rod 72, will cause the link 65 to pivot around its axis 64, such pivotal movement of the link 65 also causing the block 67 to pivot around its axis 68 (see Fig. 10). As the spring fingers 80 are carried by the block 67, they will be moved upwardly, from the solid to the upper dotted line position in Fig. 3, firmly gripping the tube 104 that is lying in the seat afforded by the saddle member 85. Owing to the resilient character of the fingers 80 they will grip the tube firmly but yield if necessary so as to avoid any injury to the tube. By the time fingers 80 have moved into firm gripping relationship with the tube 104 the pivotal movement of the link 65 around its axis 64 will have brought the block 67 into engagement with the end of the screw 75 carried by the rigid lug 73 on the carriage 59. Therefore, further movement of the piston 88 to the right will move the carriage 59 as a unit from the position shown in Fig. 3 to the position shown in Fig. 4 where the forward movement of the carriage is stopped by the engagement thereof with the stop screw 95. This is the delivery position of the tube from which the tube is to be picked up by the corrugating machine or by other suitable mechanism with which the feed mechanism is associated. Admission of hydraulic fluid through pipe 91 to the opposite end of the cylinder 89 will now initiate movement of the piston to the left as viewed in Fig. 3. The first movement of piston rod 72 moves the link 65 around its axis 64 so as to withdraw block 67 from the end of screw 75, lowering the spring fingers 80 to the lower dotted line position so as to free the tube on the saddle member 85 (see Fig. 11), and then when the block 67 has been moved to the position in which it engages the screw 76 rigidly carried by the lug 74 the carriage is moved to the left as viewed in Fig. 3 and returned to its original position where it is stopped by engagement with the adjustable stop screw 94, in which position stop screw 106 reengages stop member 105 to move the fingers 80 back to intermediate position as shown in Fig. 9 in which position they are sufficiently spaced from saddle member 85 to permit a tube to enter the latter but not escape over the ends of the fingers. By adjusting the screws 75 and 76 the extent of movement of the fingers 80 before movement of the carriage 59 is effected can be nicely predetermined to assure proper gripping and releasing of the transported tube with different diameters of tubes to be handled.

As the carriage approaches the limit of its movement illustrated in Fig. 3 the lug 87 on said carriage engages the depending arm 47 and causes said arm to move around its axis 45, similarly moving lever 44 in a clockwise direction as viewed in Fig. 3, through engagement with

stop screw 49 thereon, so that, by cooperation of the head 43 with the lug 42 on the bottom wall 23 of chute 21, said bottom wall is moved, downwardly and to the right as viewed in Fig. 3, against the tension of the springs 37, to the position shown in Fig. 3. This will move all of the tubes in the chute 21 forwardly, if they have not already rolled as far as they can go by the action of gravity, so that a new tube is disposed in the mouth 31 of the chute, ready to drop onto the saddle 55 as soon as said saddle reaches its position shown in Fig. 3.

When the carriage is moved forwardly as before explained to advance a tube on the saddle 55 to delivery position the movable bottom wall 23 of the chute 21 is moved, upwardly and to the left as viewed in Fig. 3, by the retraction of the springs 37, as rapidly as such is permitted by the movement of lug 37 away from the depending arm 47 and its associated lever 44. Thereby the bottom wall 23 is returned to its position for a new advance movement when the carriage 59 again returns to its limit position. During movement of the carriage to the delivery position of the tube the lowermost tube in the chute is resting on the flat surface of the member 36 and cannot escape from the chute until the carriage has returned to its limit position to dispose the saddle member 55 beneath the mouth of the chute. The reciprocating motion imparted to the bottom wall 23 of the chute operates to vibrate the tubes in contact therewith so as to prevent jamming of the tubes at the inlet to the chute. The size of the chute from the crest to the corrugations to the opposite stationary wall 22 of the chute is such that if the chute is full the tubes resting on the corrugated wall 23 are merely rolled over such crests, without injury to the tubes, during the reciprocation of the wall 23, but if there is any gap in the chute the corrugations on the bottom wall 23 will positively displace the tubes until the gap is closed up.

It will therefore be preceived that by the present invention a simple, positive and highly efficient feeding mechanism has been provided which removes tubes one at a time from the hopper and transports them to a suitable delivery position under conditions which enable the machine to be operated at high speed with assurance that a tube will be delivered from the hopper to the transporting mechanism and then moved to tube delivery position at each stroke of the hydraulic mechanism. The tubes during transportation are firmly gripped against displacement, but the mechanism for gripping and transporting the tubes is of such construction that walls of very thin metal may be handled with assurance that they will not be injured. The gripping of the tube and thereafter the movement of the carriage to delivery position, and the releasing of the tube and the movement of the carriage to receiving position, are effected by the operation of a single member performing its functions in sequence, while the mechanism for assuring positive displacement of the tubes from the hopper is also operated in proper sequence from the same member. Therefore, the feeding functions are effected by a minimum number of parts operating in properly timed sequence to assure the intended operation. Owing to the provisions for adjustment the feeding mechanism may be easily and quickly adjusted to handle tubes of different lengths and different diameters.

While the embodiment of the invention illustrated on the drawings has been described with considerable particularity it is to be expressly

understood that the invention is not limited thereto, as the same is capable of receiving a variety of mechanical expressions, as will now be apparent to those skilled in the art, and changes may be made in the details of construction, arrangement and proportion of parts, provisions for adjustment, etc., and certain features may be used without other features, without departing from the spirit of the invention. Reference is therefore to be had to the appended claims for a definition of the invention.

What is claimed is:

1. In a tube feeding mechanism, the combination of a member movable from a tube receiving position to a tube delivery position and including means providing a seat in which a tube to be transported is deposited, a hopper provided with a chute for supplying tubes one at a time to said seat, means carried by said member and movable into and out of a position for gripping a tube on said seat, driving means for said member, a single means movably mounted on said member and operatively connected to said gripping means and said moving means and operable by the latter for first moving said gripping means into its gripping position, means on said member engageable by said single means and operable by said moving means for thereafter initiating the movement of said member toward delivery position, a second means on said member engaged by said single means after said single means has moved said gripping means to non-gripping position for initiating the return movement of said member to tube receiving position, and means associated with said chute for positively advancing tubes therein and operated by said member as it approaches tube receiving position.

2. In a tube feeding mechanism, the combination of a member movable from a tube receiving position to a tube delivery position, a hopper provided with a chute for supplying tubes to said member when said member is in receiving position, said chute including a bottom wall mounted for reciprocation in its own plane and having a corrugated formation to vibrate tubes in said chute during reciprocation, and means on said member for reciprocating said bottom wall as said member moves into tube receiving position.

3. In a tube feeding mechanism, the combination of a member movable from a tube receiving position to a tube delivery position and including a seat for reception of a tube to be transported, means for supplying tubes one at a time to said seat, a member pivotally mounted on said first named member and provided with means for gripping a tube on said seat, means on said first named member engaged by said pivotally mounted member when the latter has been moved into tube gripping position for thereafter moving said first named member from said pivotally mounted member, driving means for said first named member operatively connected to said pivotally mounted member, and a second means on said first named member and engageable by said pivotally mounted member when moved in the opposite direction to dispose said gripping means in non-gripping position and thereafter move said first named member in the opposite direction toward tube receiving position.

4. In a tube feeding mechanism, the combination of a member movable from a tube receiving position to a tube delivery position and including a seat for reception of a tube to be transported, means for supplying tubes one at a time to said seat, a member pivotally mounted on said first

named member and provided with means for gripping a tube on said seat, means on said first named member engaged by said pivotally mounted member when the latter has been moved into tube gripping position for thereafter moving said first named member from said pivotally mounted member, driving means for said first named member operatively connected to said pivotally mounted member and engageable by said pivotally mounted member when moved in the opposite direction to dispose said gripping means in non-gripping position and thereafter move said first named member in the opposite direction toward tube receiving position, and means for adjusting said last named means to provide for variable movement of said pivotal member before initiating the return movement of said first named member.

5. A tube feeding machine comprising in combination, a reciprocable member movable between a tube receiving position and a tube delivering position and including a seat for reception of a tube to be transported, means for depositing tubes one at a time on said seat, gripping means mounted on said reciprocable member for pivotal movement into and out of gripping relation with a tube on said seat, means for imparting said pivotal movement to said gripping means including a connecting member pivotally mounted at one end on said reciprocable member and secured at the opposite end to said gripping means for operating the same, and driving means operatively engaging said connecting member intermediate the ends thereof and movable in one direction for first operating said gripping means and thereafter moving said reciprocable member and said gripping means as a unit between said tube receiving and delivering positions.

6. A tube feeding machine as defined in claim 5 wherein said connecting member is loosely mounted at said opposite end thereof on said gripping means, said driving means being loosely mounted on said connecting member.

7. A tube feeding machine as claimed in claim 6 wherein stop means are carried on said reciprocable member for limiting pivotal movement of said gripping means.

8. A tube feeding machine, comprising in combination, a reciprocable member movable between a tube receiving position and a tube delivering position and including a seat for reception of a tube to be transported, means for depositing tubes one at a time on said seat, gripping means mounted on said reciprocable member for pivotal movement into and out of gripping relation with a tube on said seat, a pair of stop members carried on said reciprocable member for limiting pivotal movement of said gripping means at either end of said pivotal movement,

means for imparting said pivotal movement to said gripping means including a connecting member pivotally mounted at one end on said reciprocable member and secured at the opposite end to said gripping means for operating the same, driving means operatively engaging said connecting member intermediate the ends thereof and movable in one direction for first operating said gripping means and thereafter moving said reciprocable member and said gripping means as a unit between said tube receiving and delivering positions, and means operable on said gripping means in said tube receiving position for positioning said gripping means intermediate either end of said pivotal movement.

9. A tube feeding machine, comprising in combination, a reciprocable carriage having a base and a top portion provided with a seat for reception of a tube to be transported between receiving and delivering positions, means for depositing tubes one at a time on said seat, gripping means mounted on said top portion for pivotal movement into and out of gripping relation with a tube on said seat, a connecting member pivotally mounted on said base and secured to said gripping means for operating the same, and driving means including a reciprocable rod member extending substantially parallel with said base and top portion and operatively engaging said connecting member, said rod member being movable in one direction for first operating said gripping means and thereafter moving said reciprocable member and said gripping means as a unit between said tube receiving and delivering positions.

10. A tube feeding machine as claimed in claim 9 wherein said connecting member comprises a link element pivotally mounted at one end on said reciprocable member and loosely mounted at the opposite end thereof on said gripping means, said rod member being loosely mounted on said connecting member intermediate the ends thereof.

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