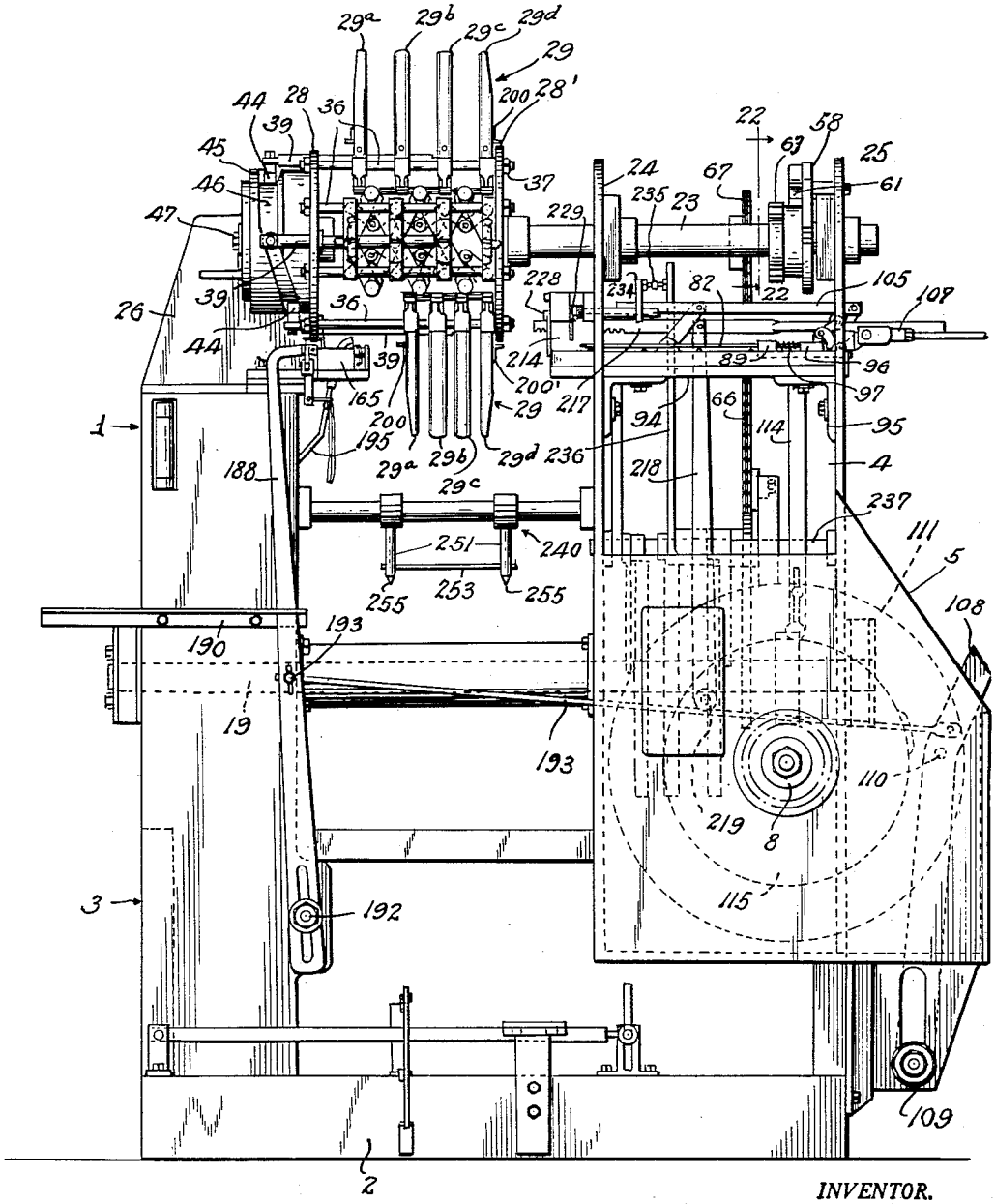
Dec. 20, 1955 E. E. WEST 2,727,477

BAG STRINGING MACHINE

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Fig. 1.



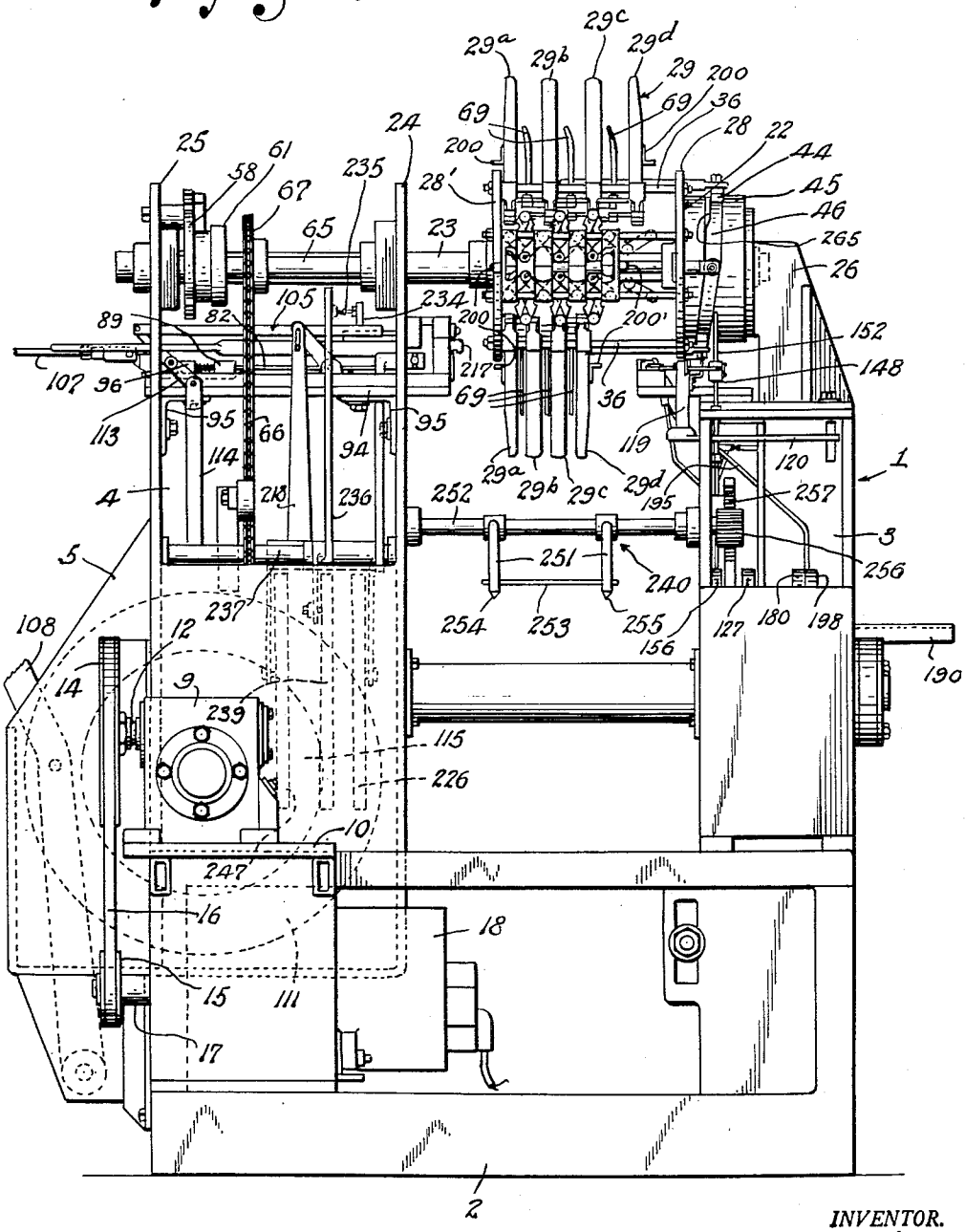
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BAG STRINGING MACHINE

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Fig. 2.



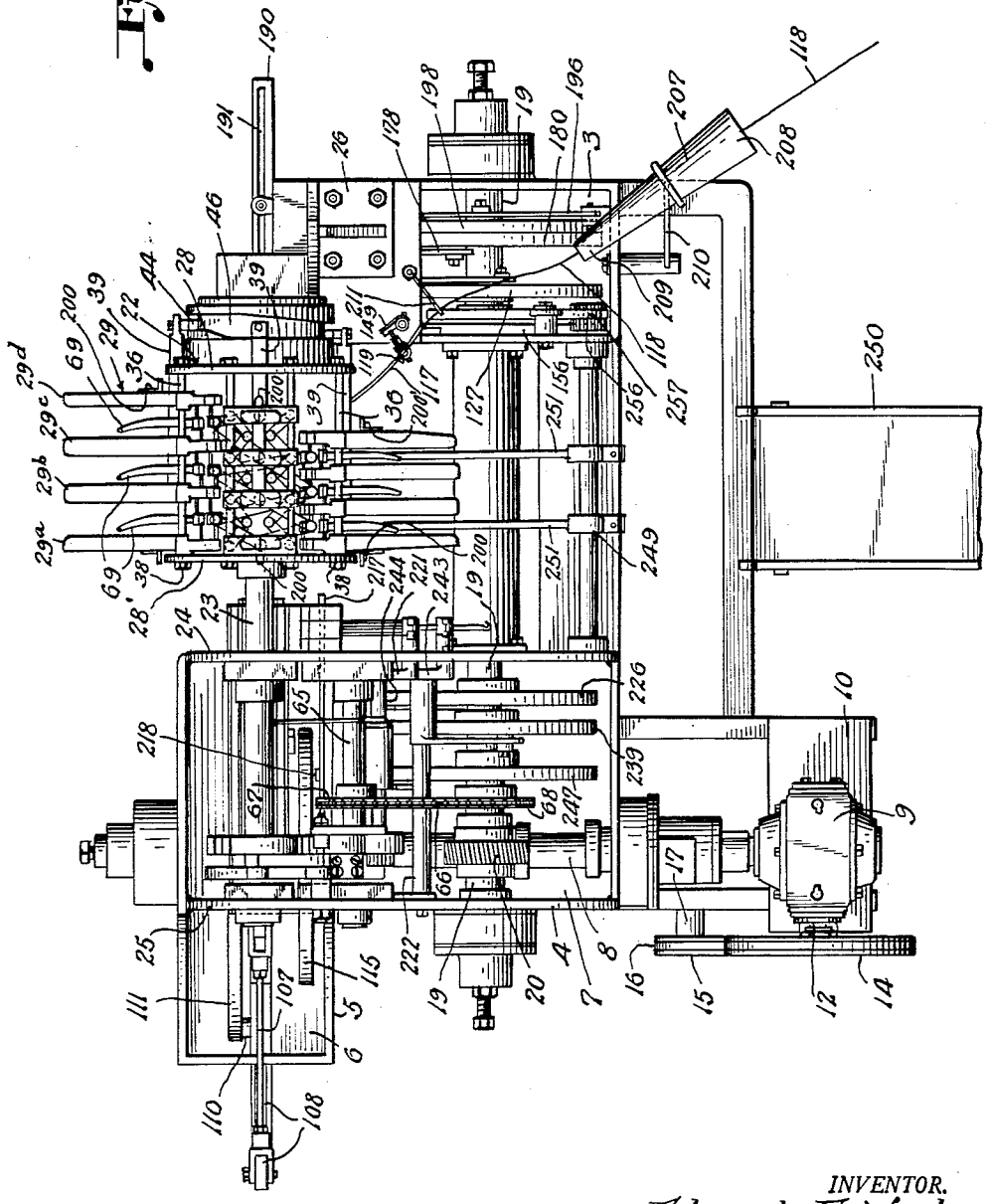
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BAG STRINGING MACHINE

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Fig. 3.



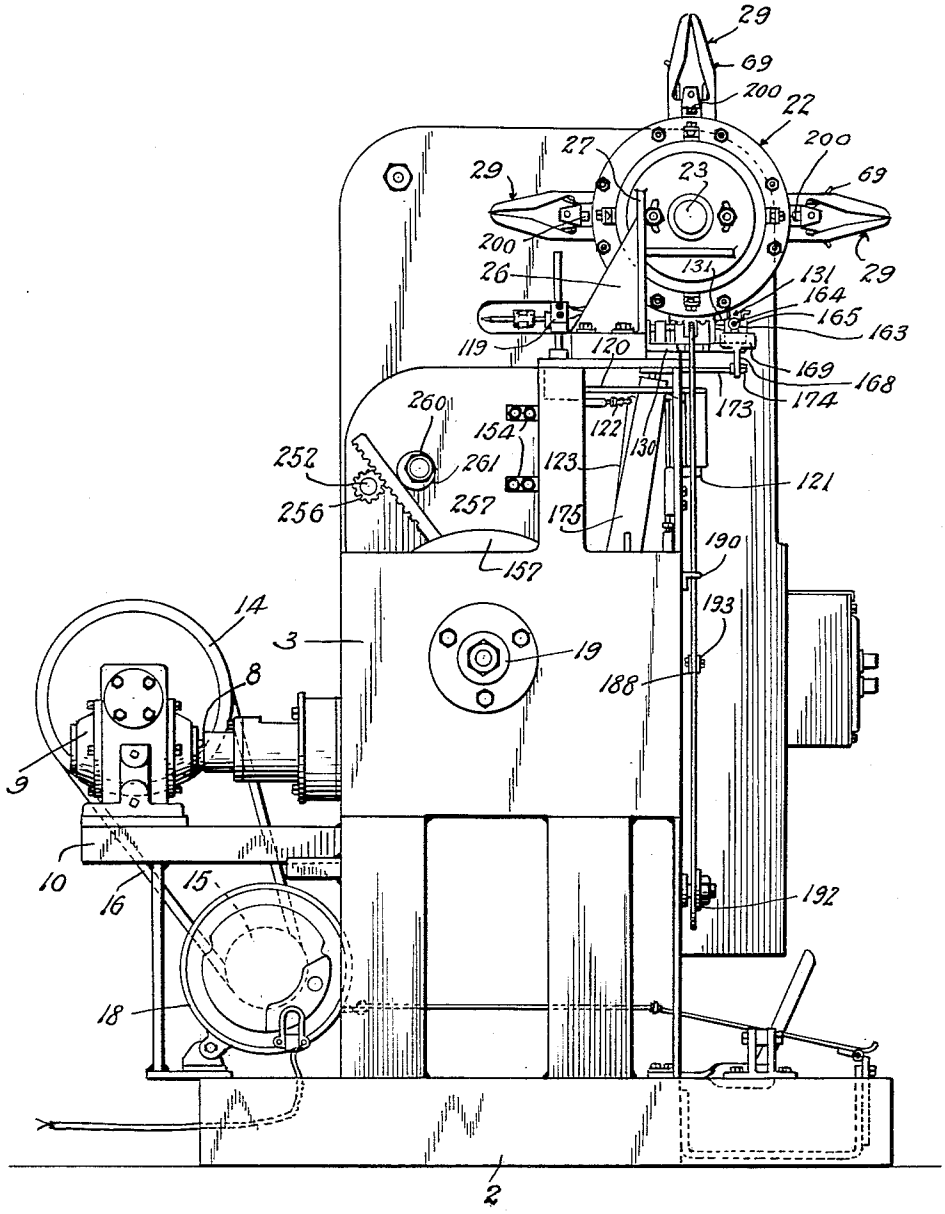
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Fig. 4.



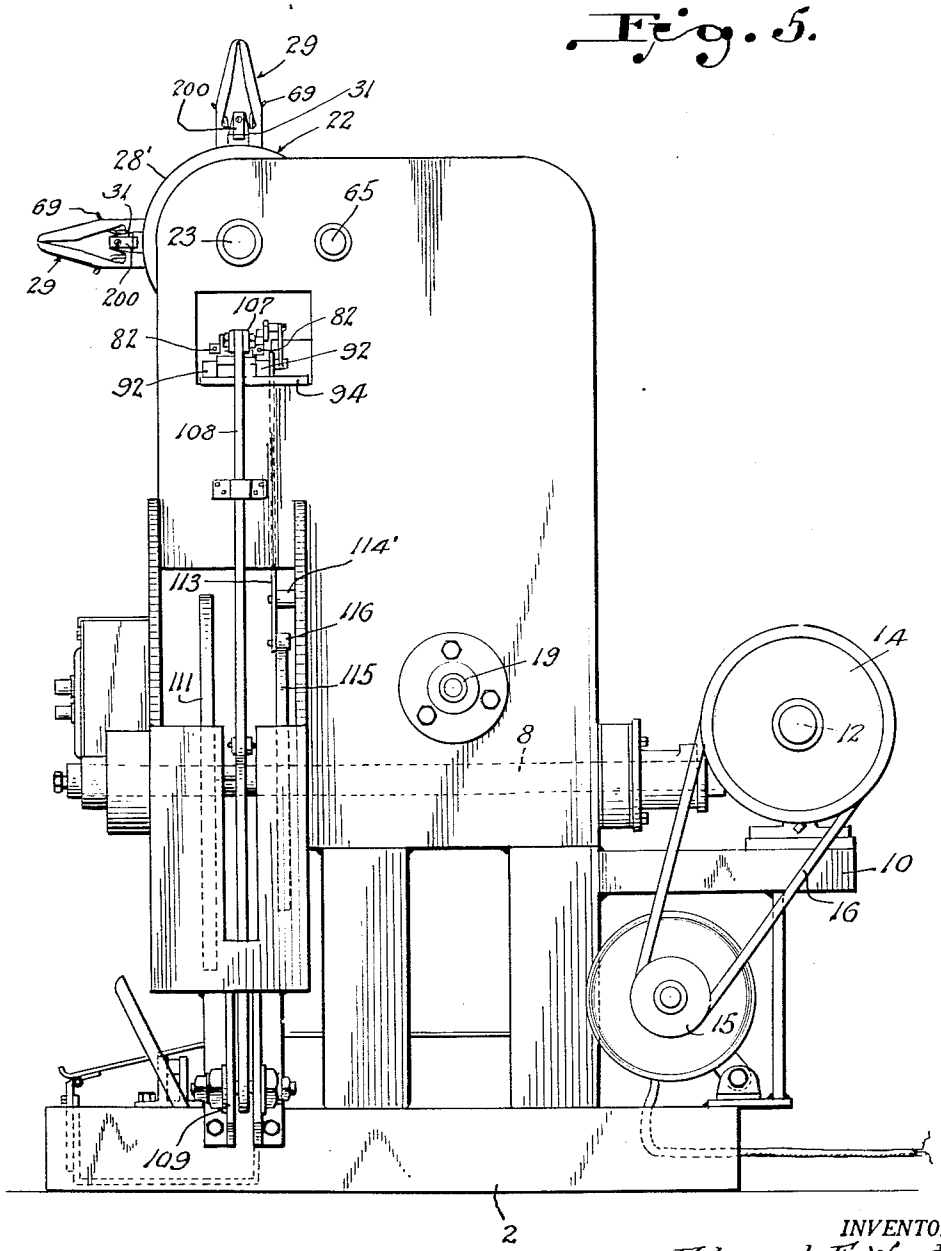
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Fig. 5.



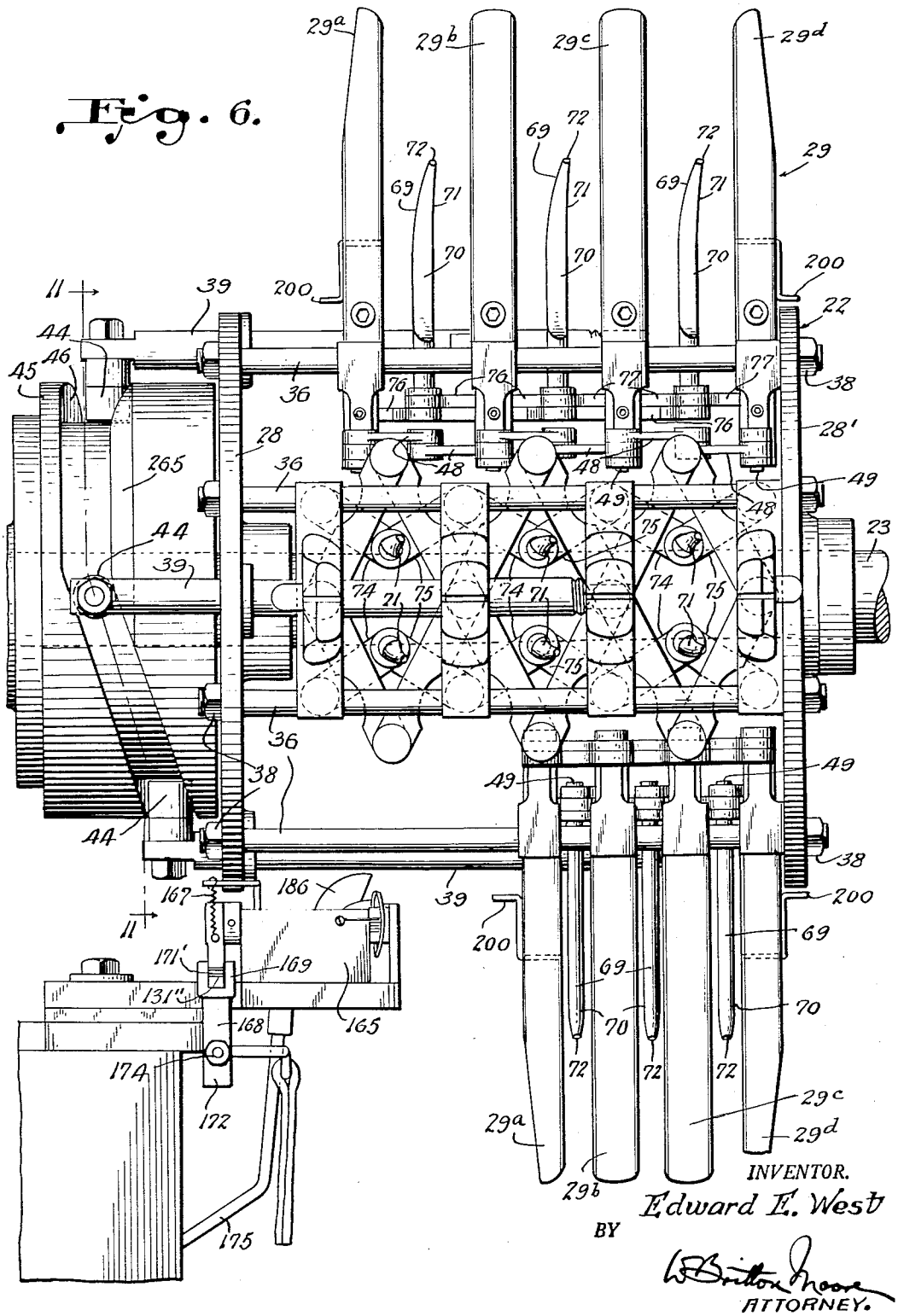
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Fig. 6.



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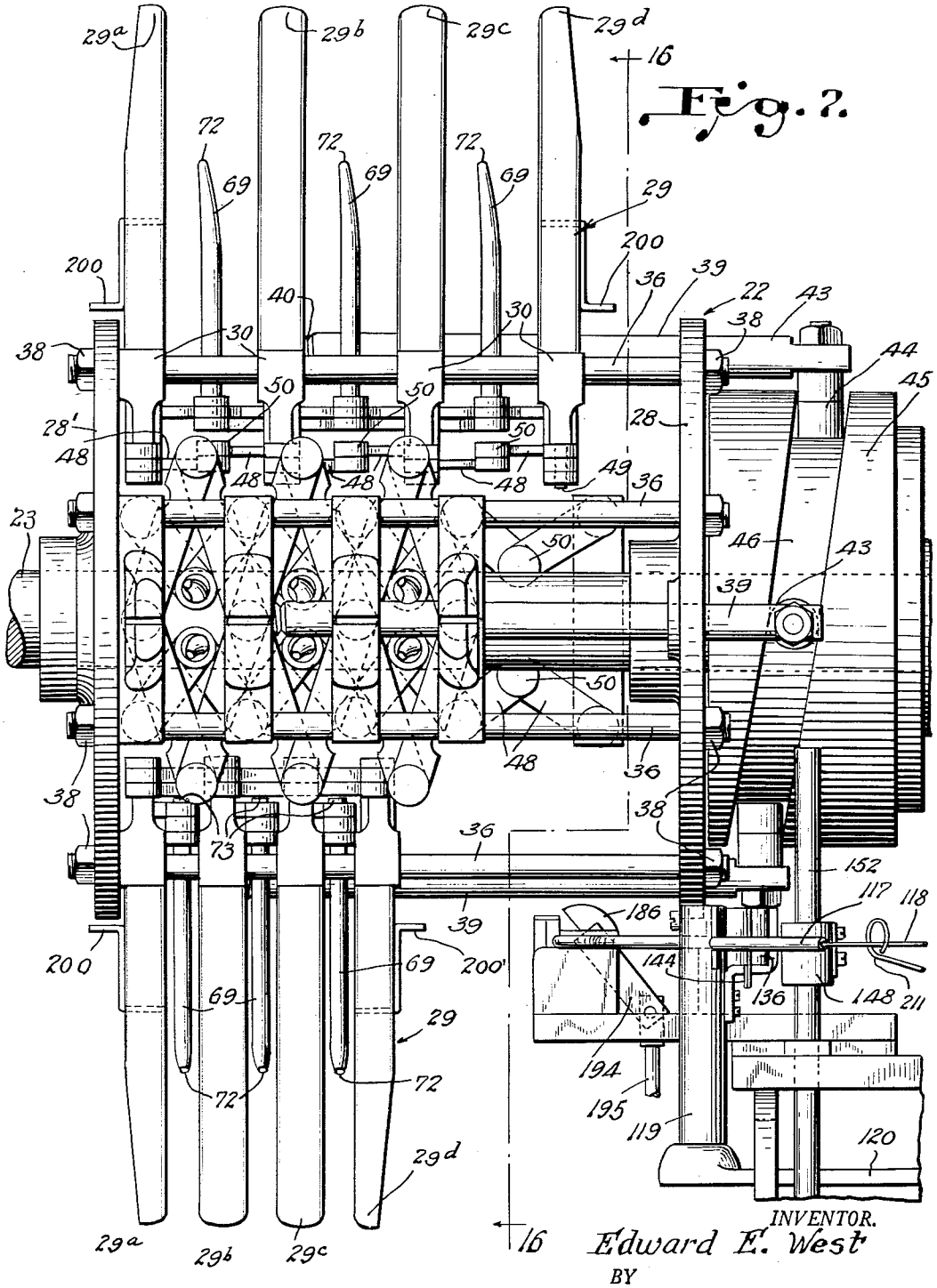


Fig. 2.

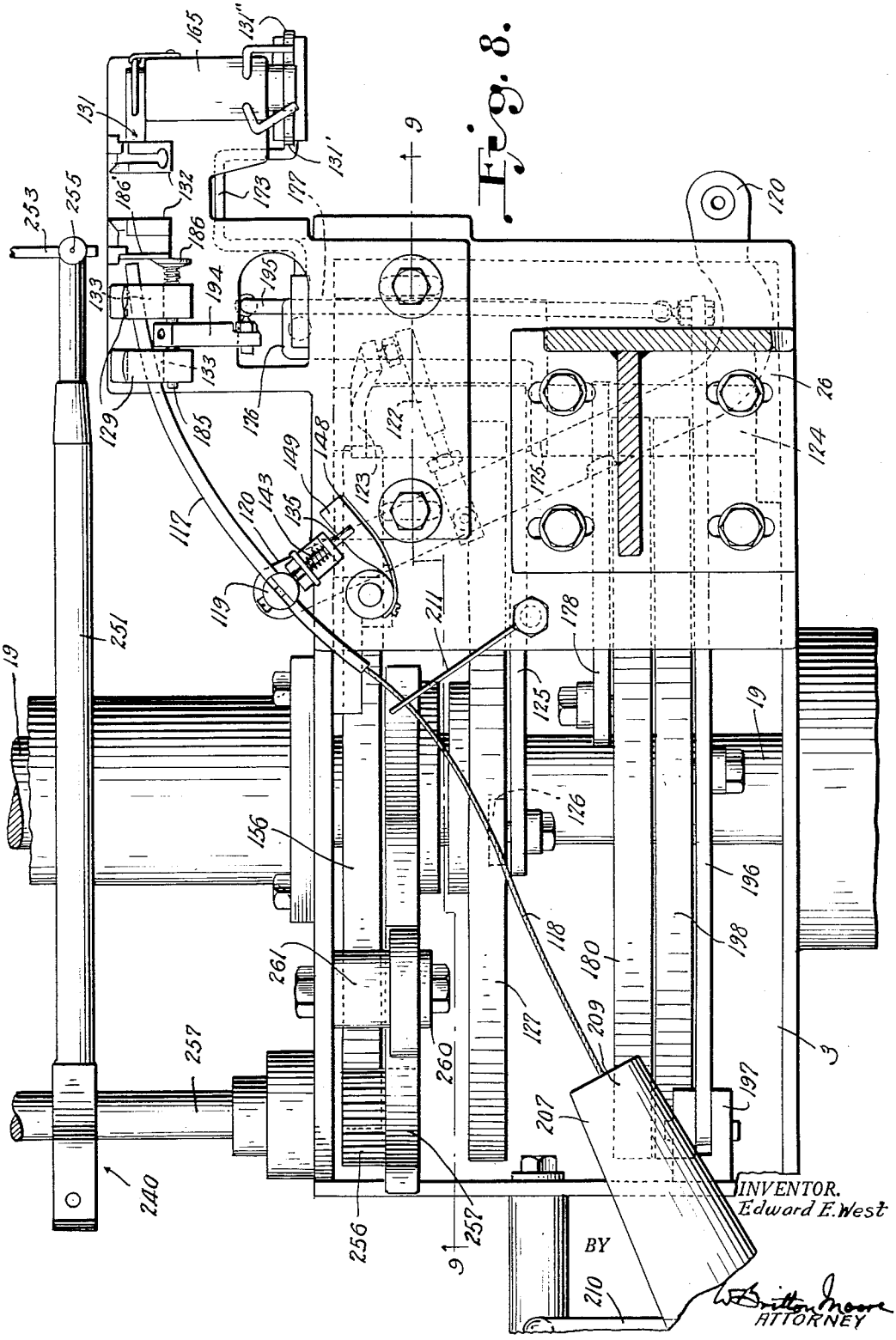
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Fig. 8.

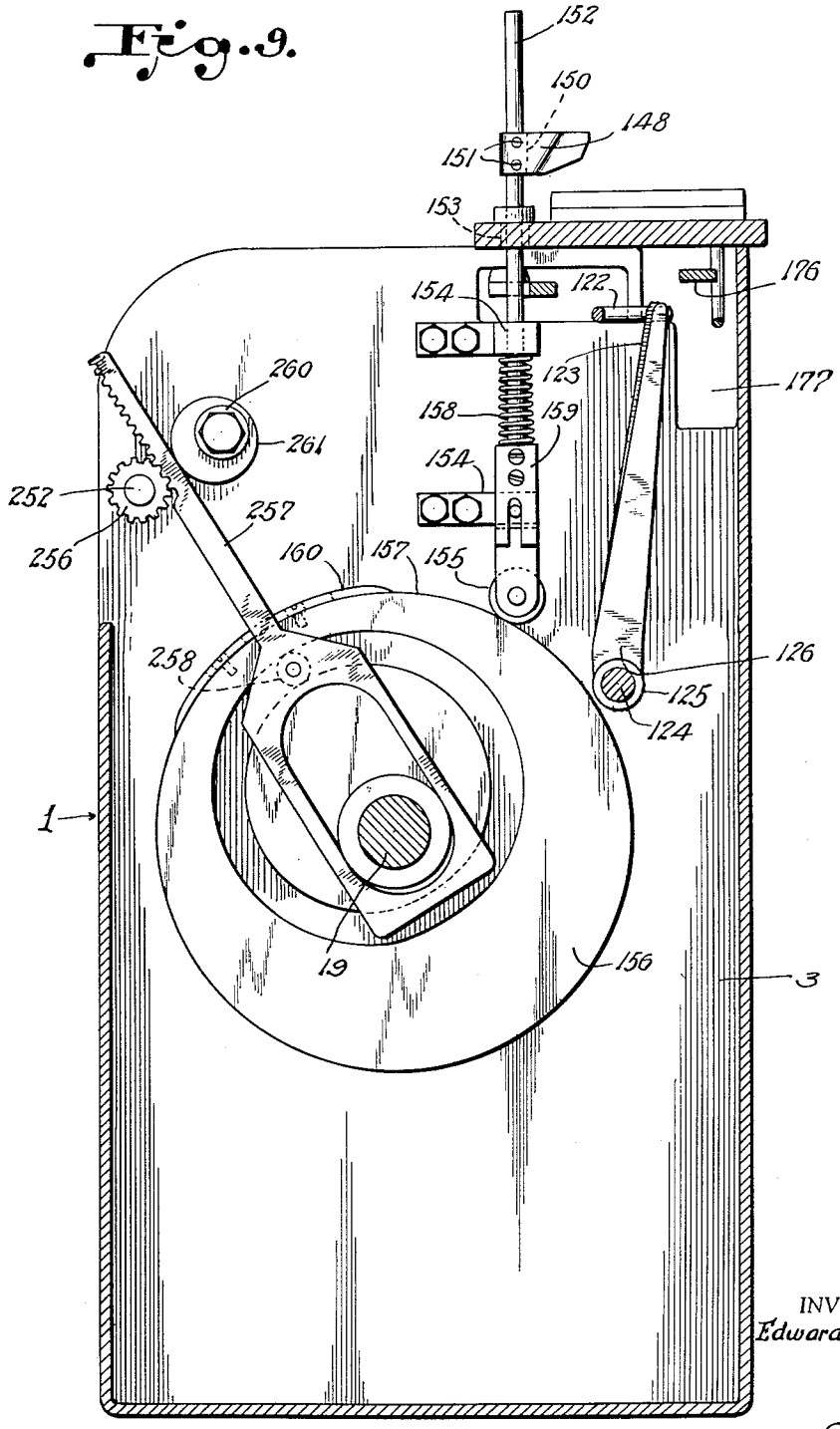


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Fig. 9.



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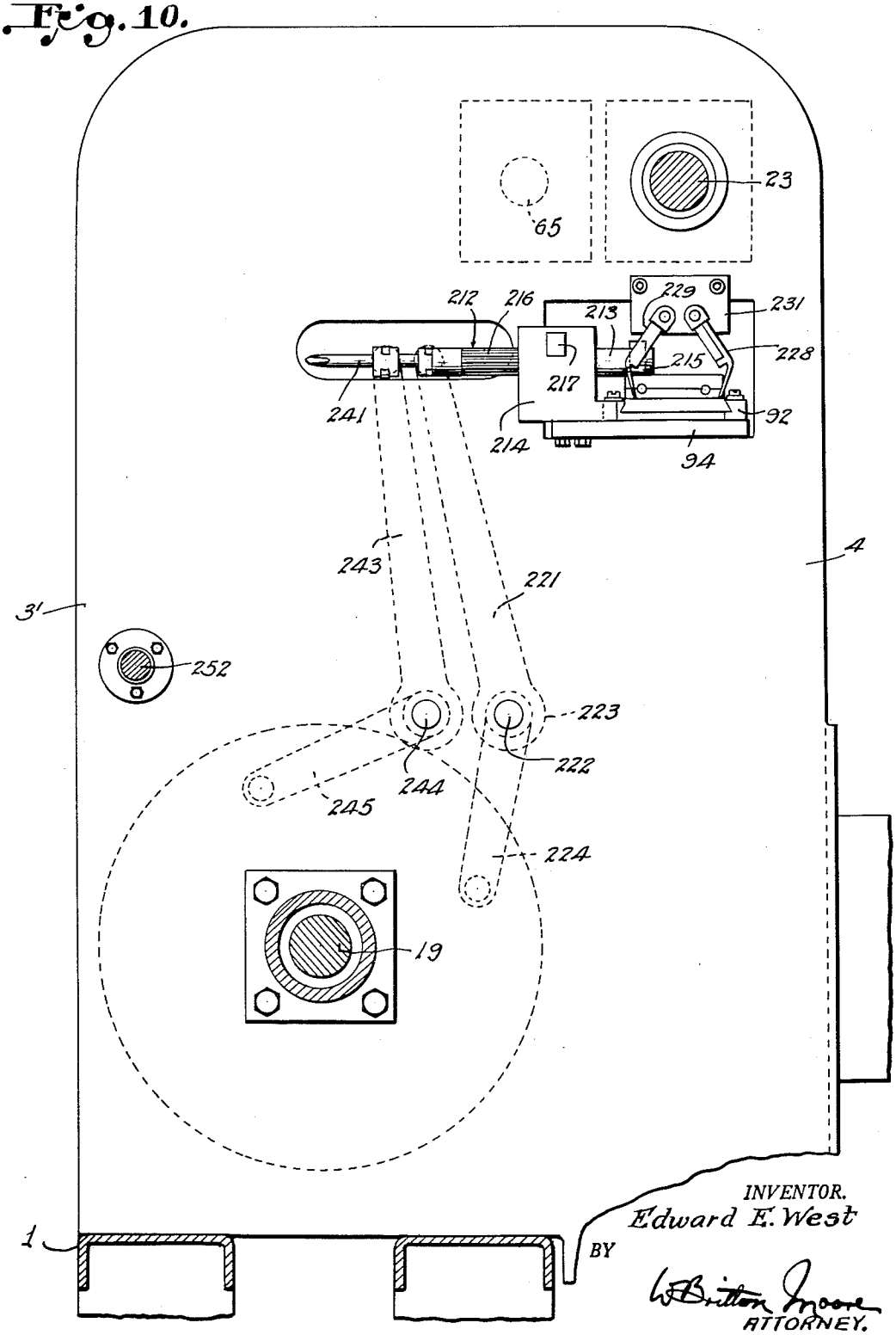
ATTORNEY

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Fig. 10.



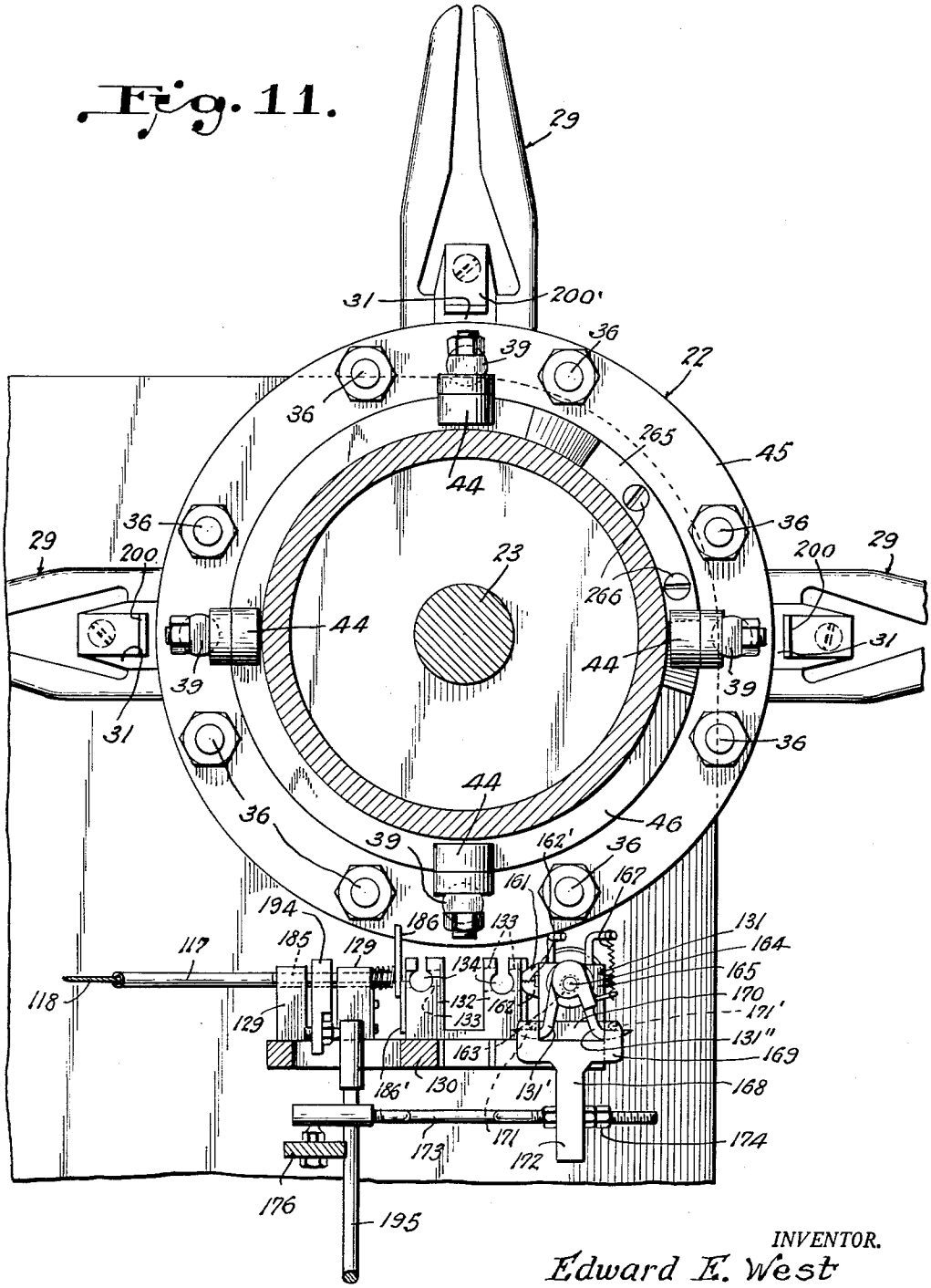
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Fig. 11.



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Fig. 12.

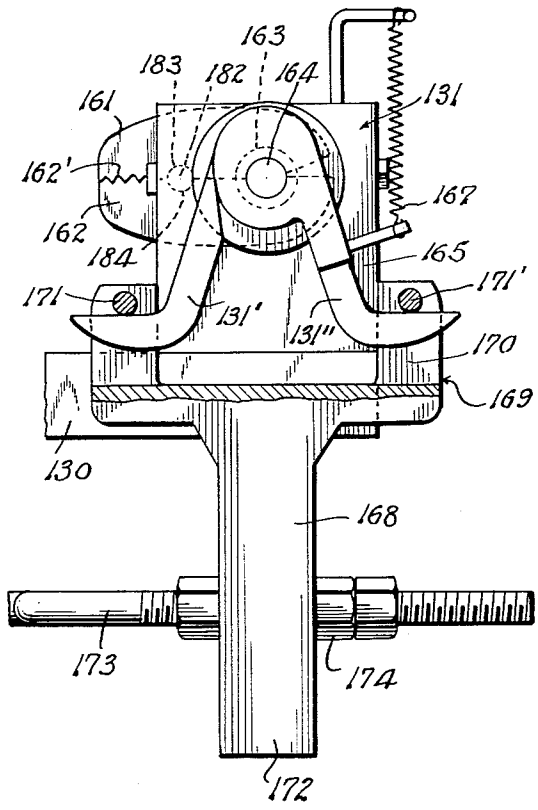


Fig. 13.

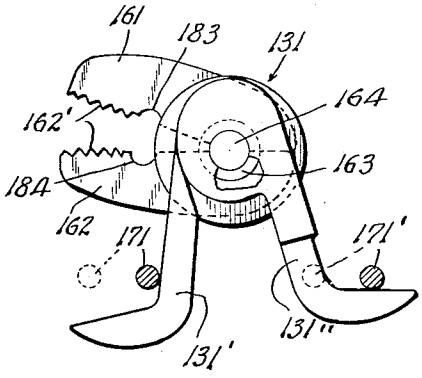


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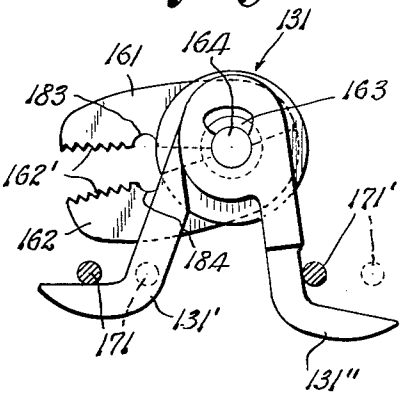
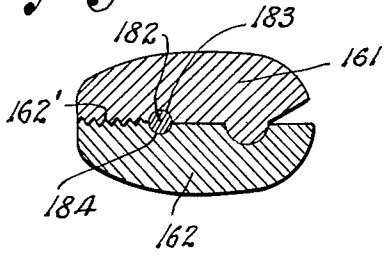


Fig. 15.



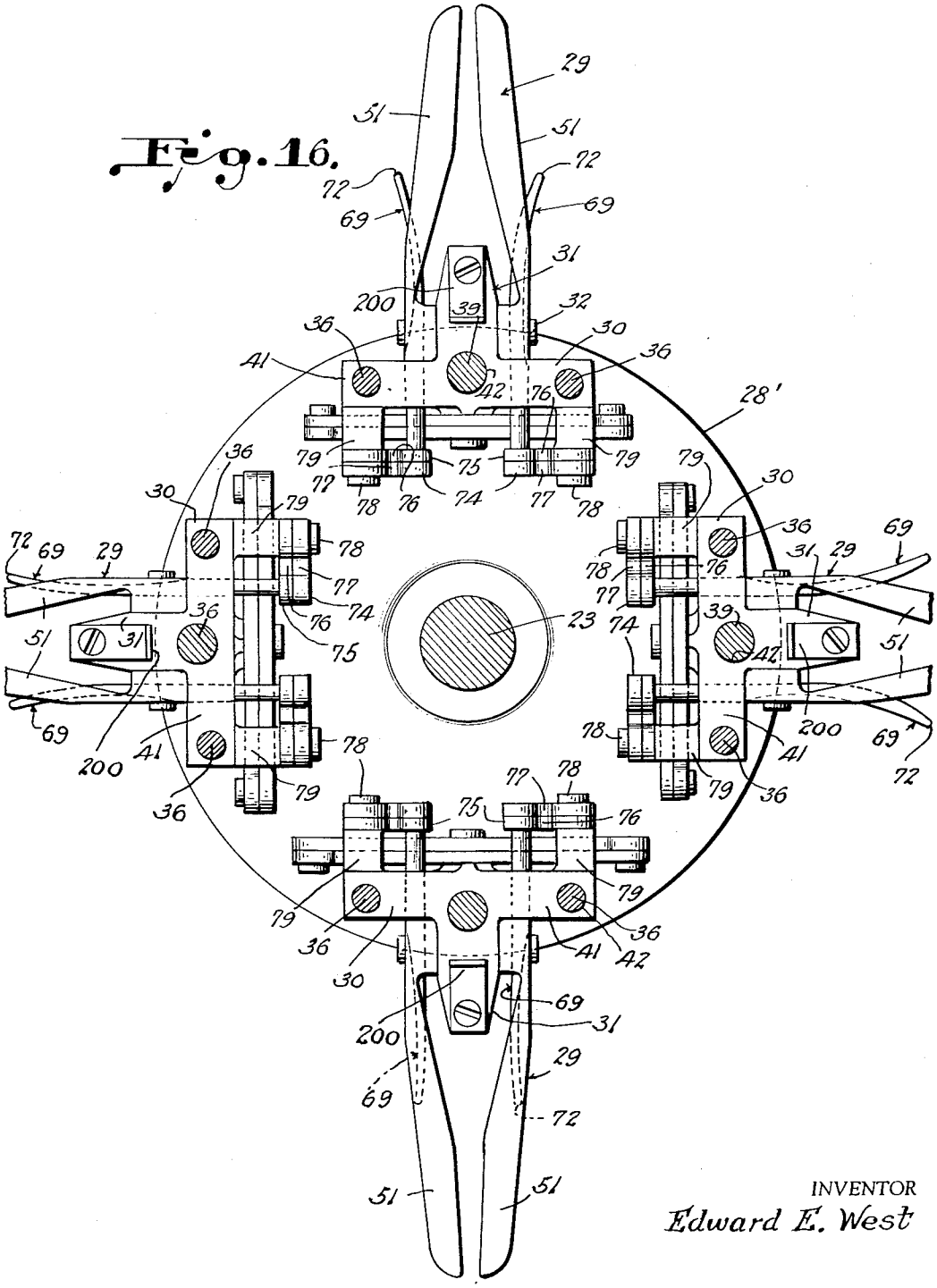
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Fig. 16.



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Fig. 17.

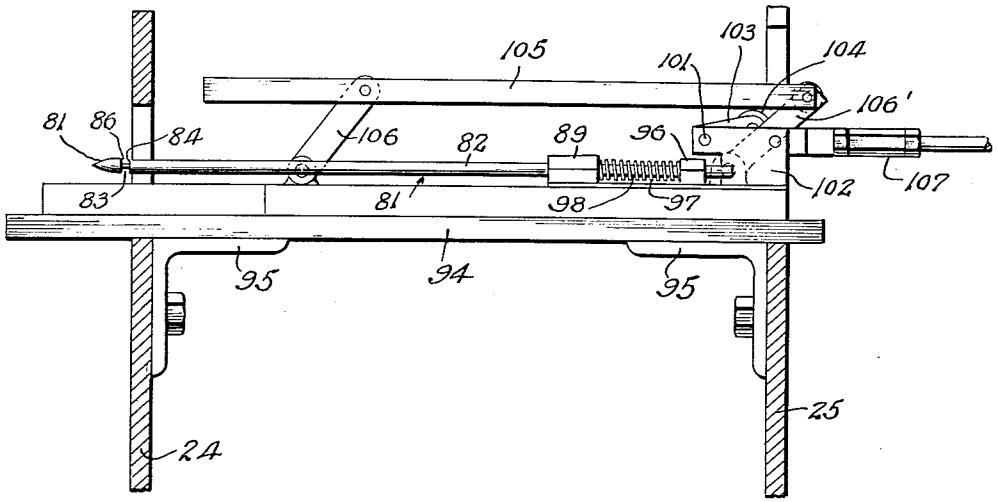


Fig. 18.

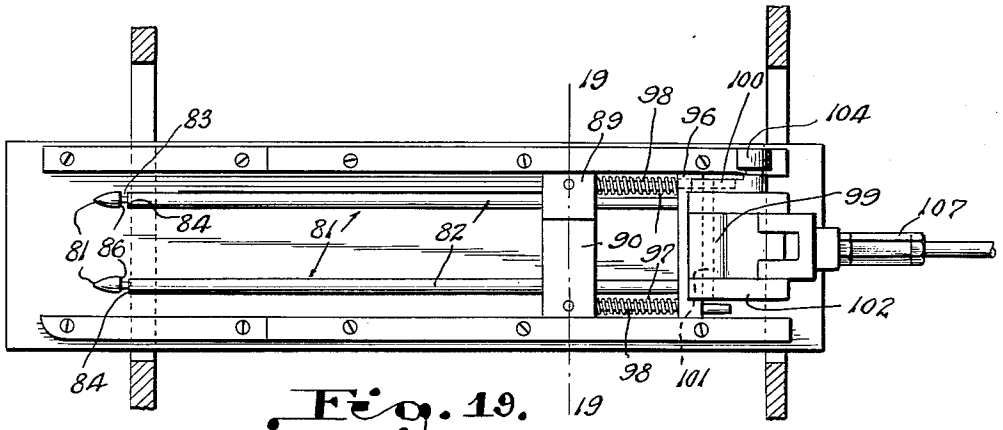
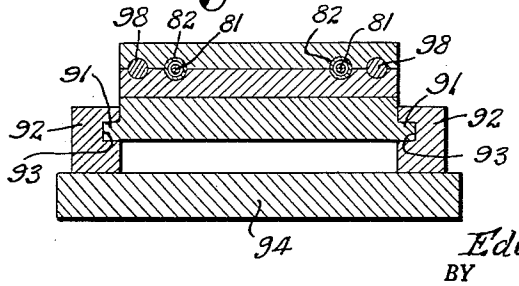


Fig. 19.



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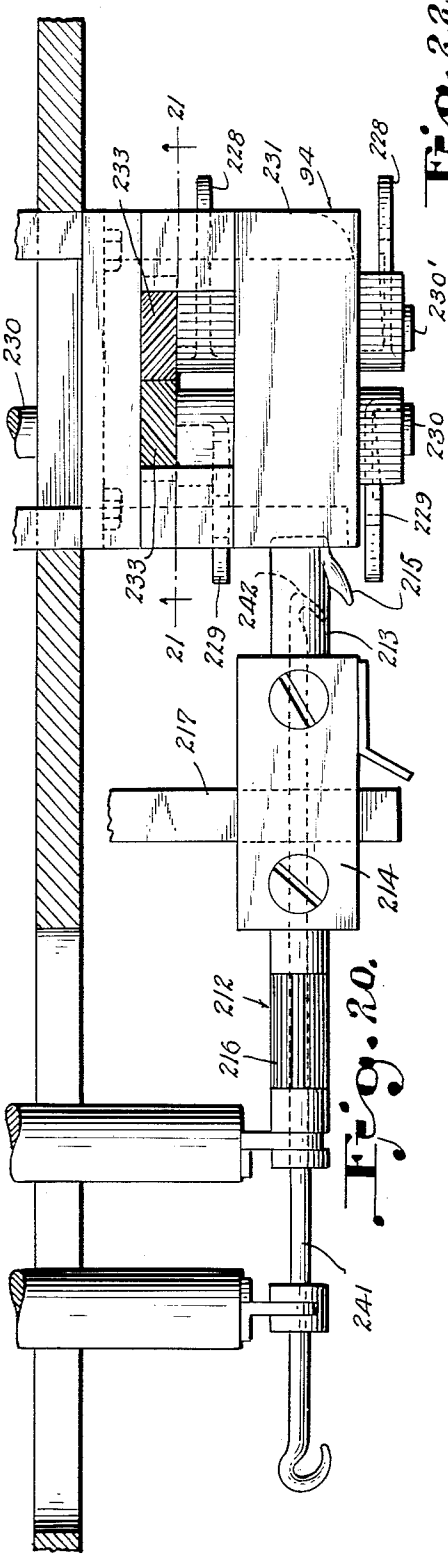


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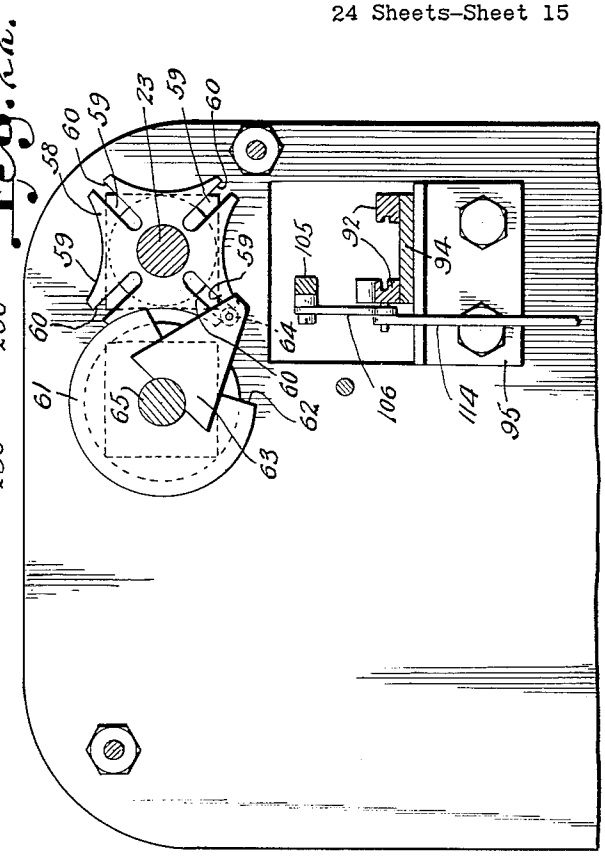


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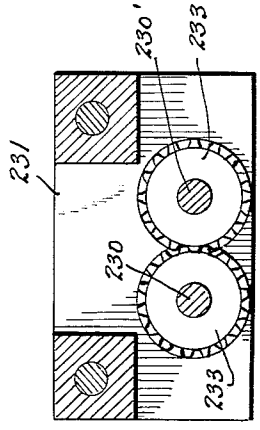


Fig. 21.

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Fig. 23.

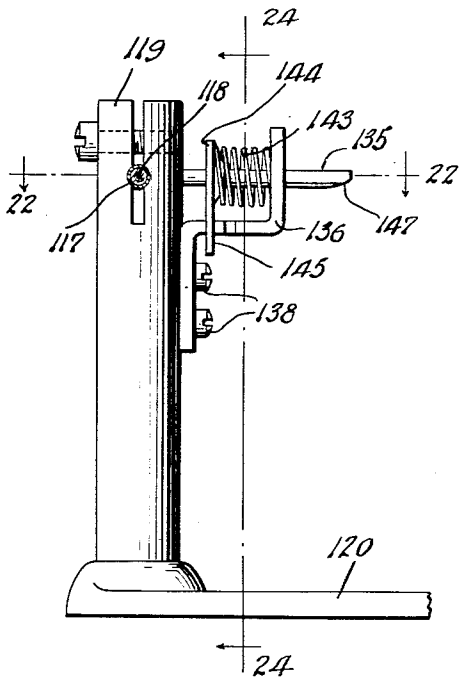


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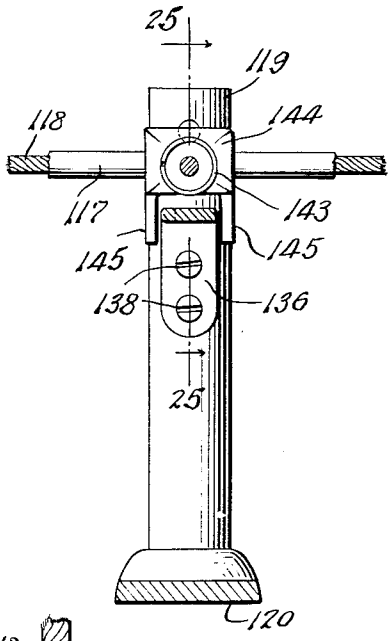


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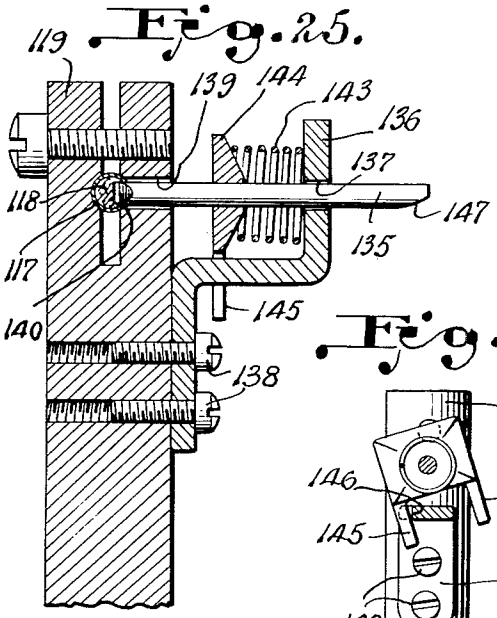


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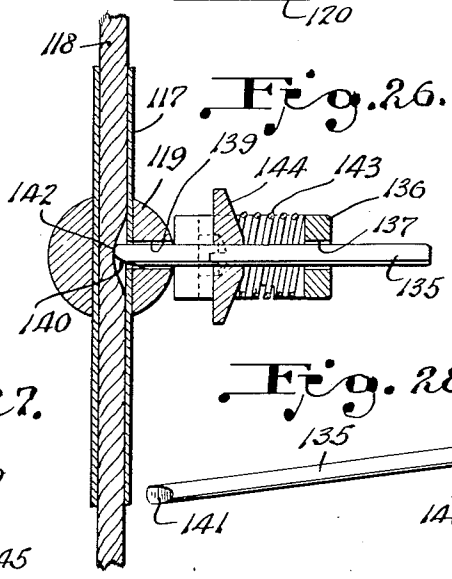


Fig. 27.

Fig. 28.

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Fig. 30.

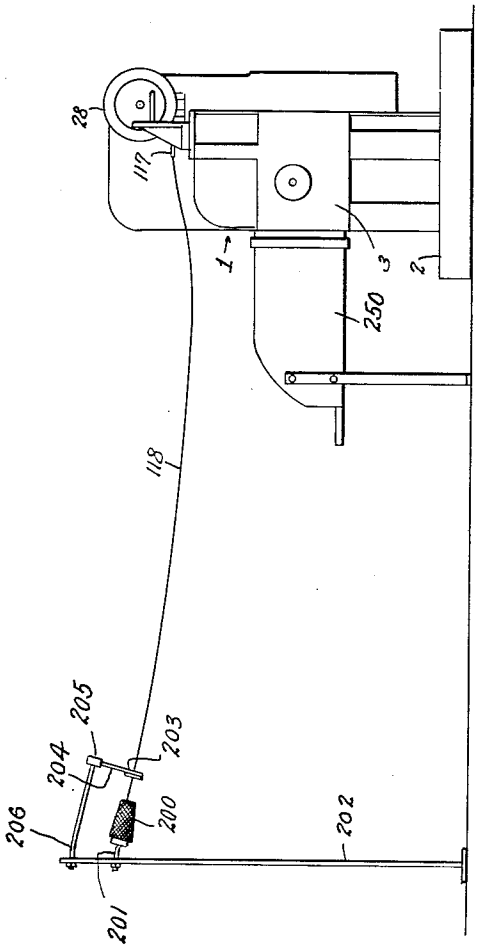
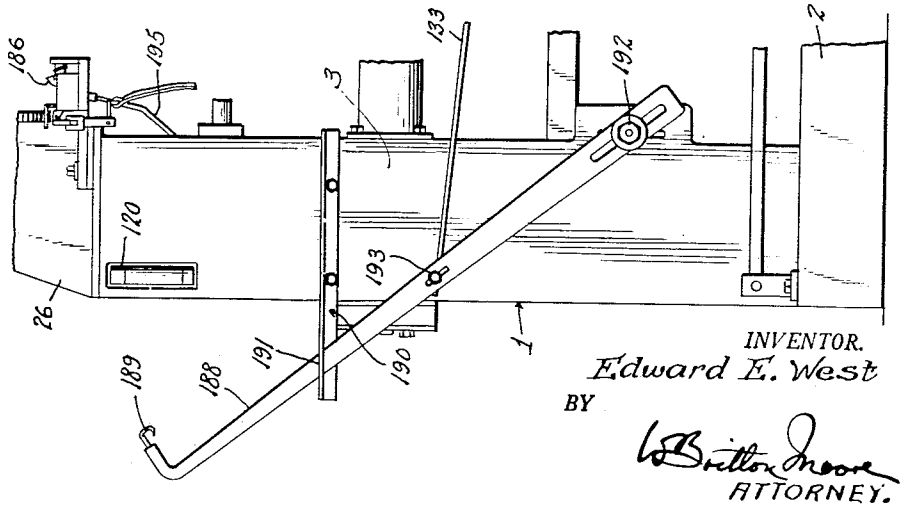


Fig. 29.



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Fig. 31.

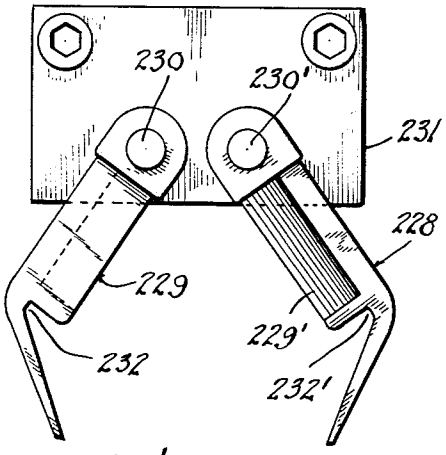
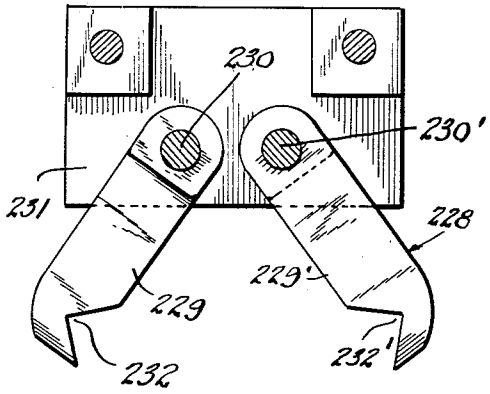


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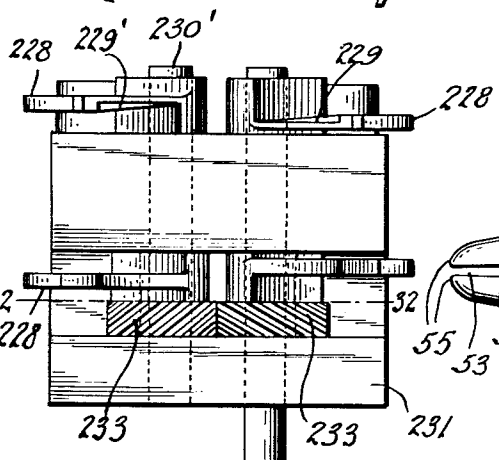


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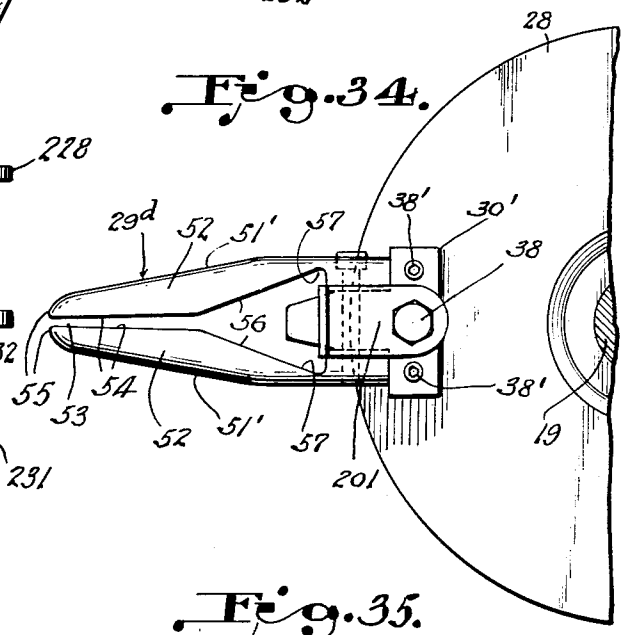


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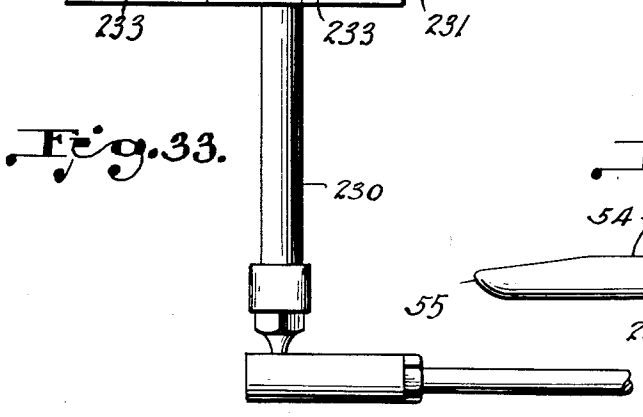
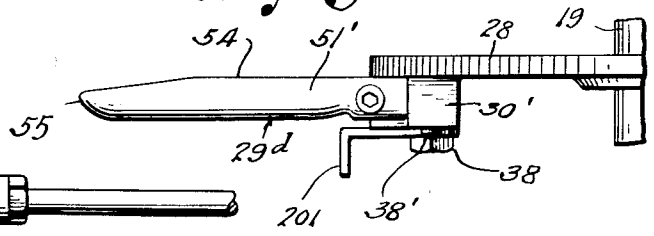


Fig. 35.



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Fig. 36.

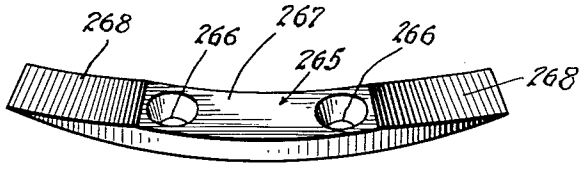


Fig. 37.

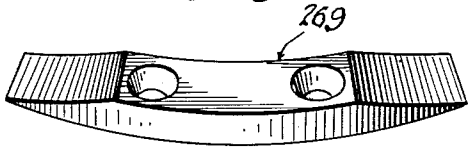
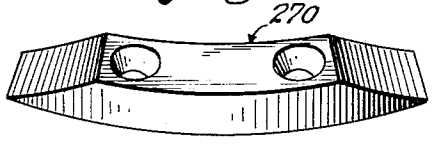


Fig. 38.



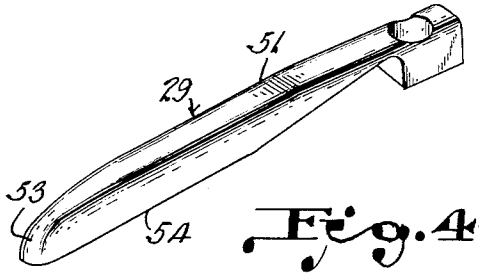


Fig. 40.

Fig. 39.

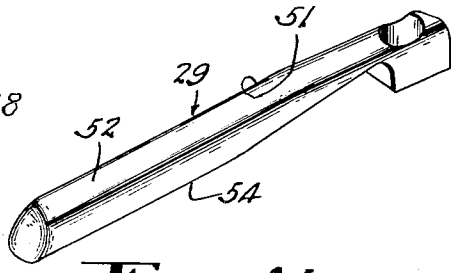


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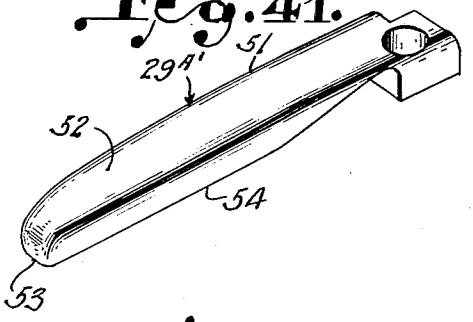
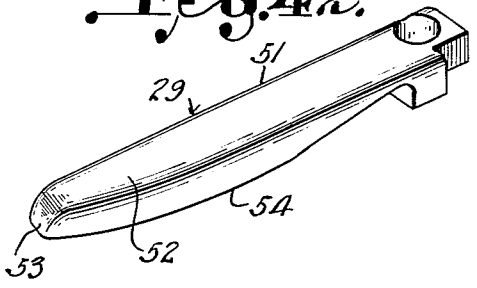


Fig. 42.



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Fig. 43.

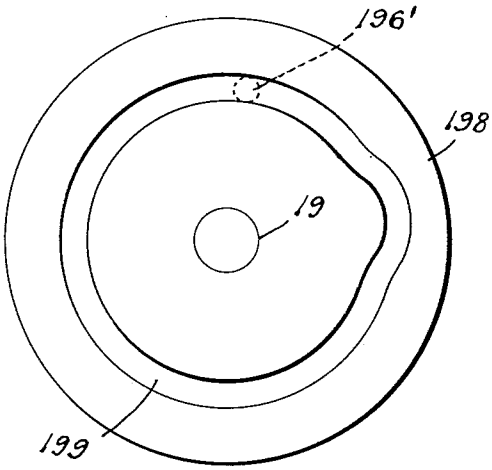


Fig. 44.

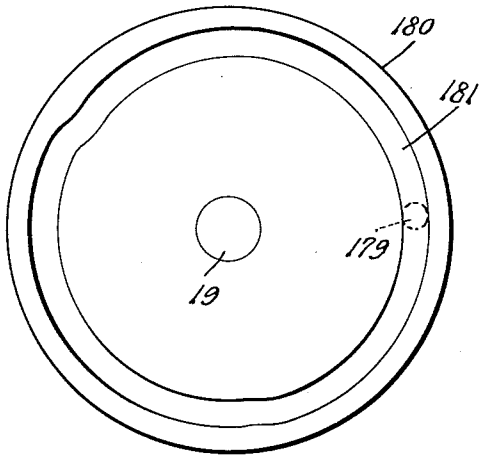


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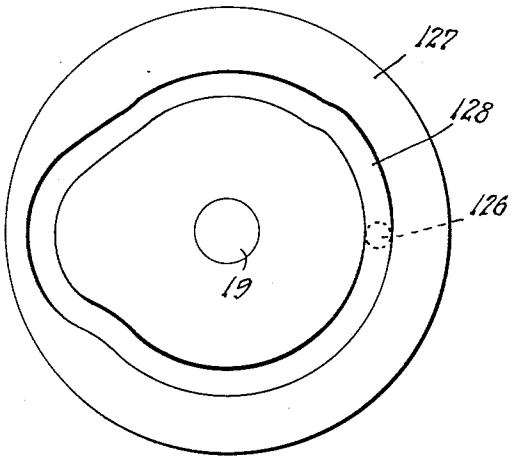
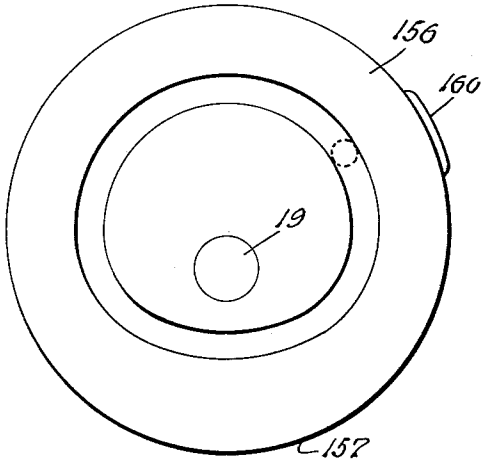


Fig. 46.



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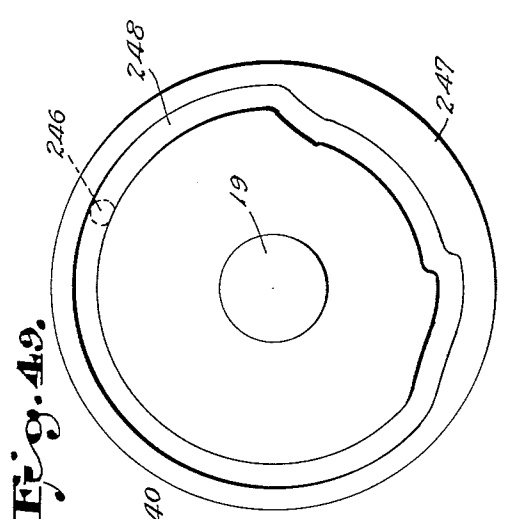


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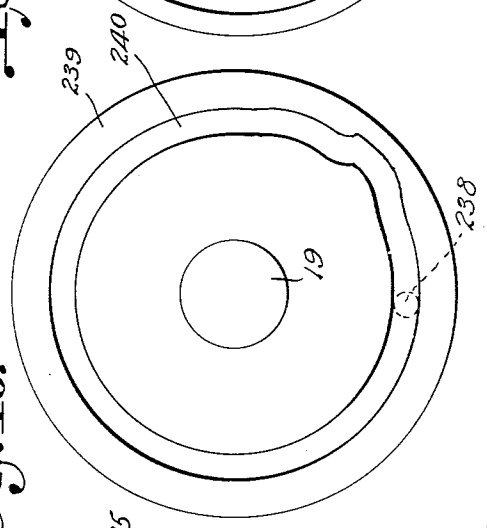


Fig. 48.

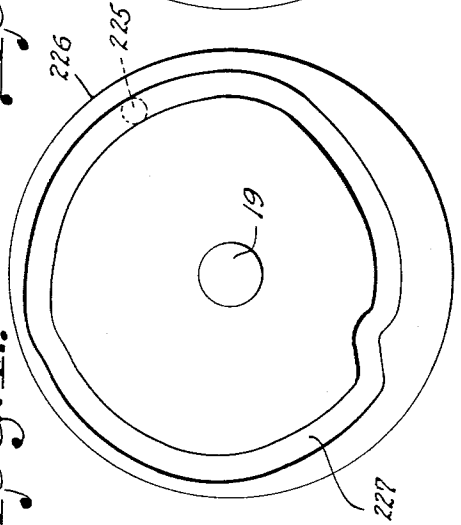


Fig. 47.

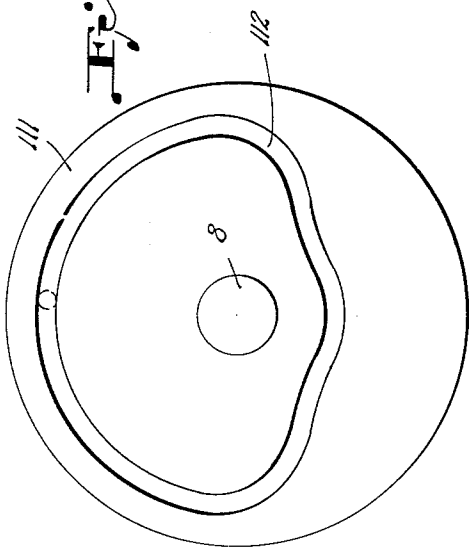


Fig. 51.

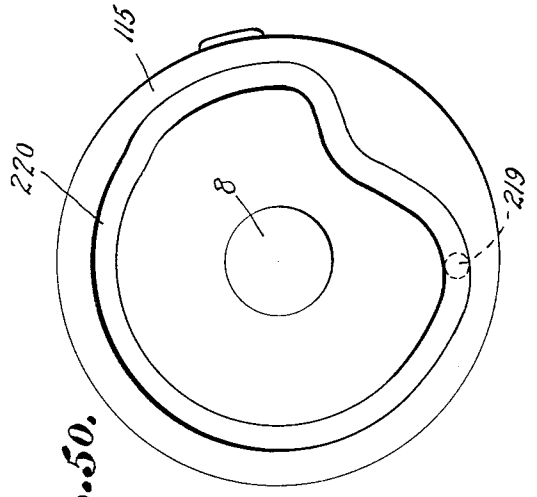


Fig. 50.

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BAG STRINGING MACHINE

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Fig. 53.

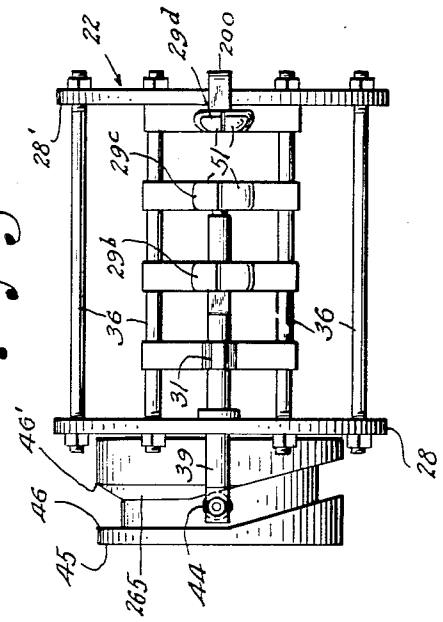


Fig. 55.

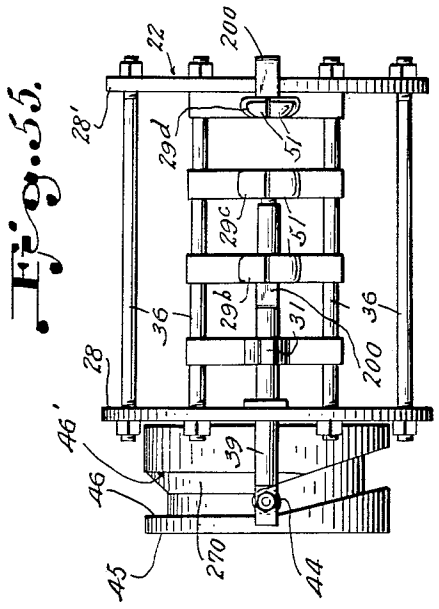


Fig. 52.

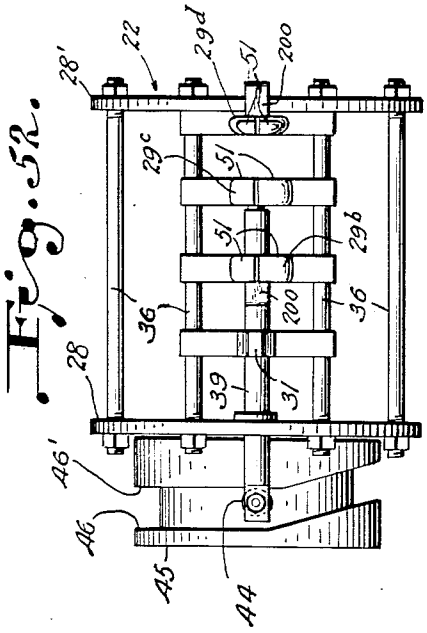
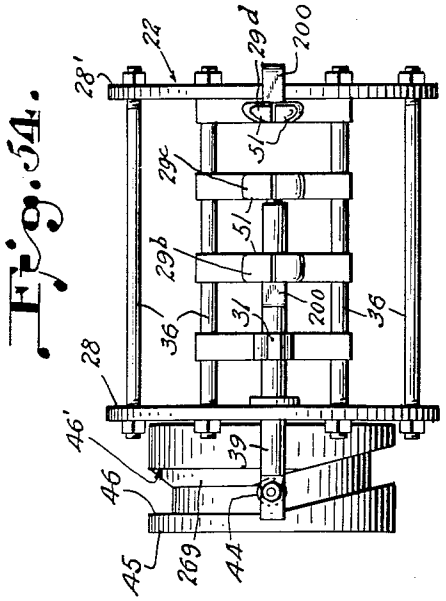


Fig. 54.



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Fig. 57.

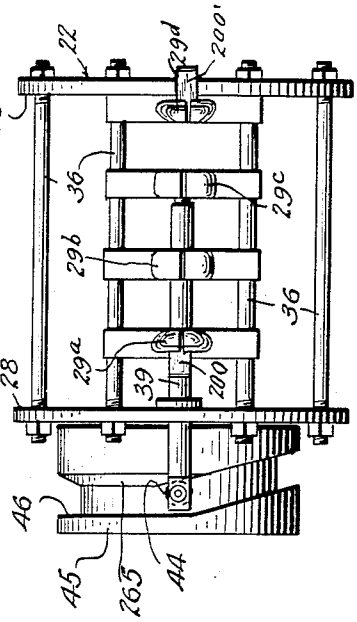


Fig. 59.

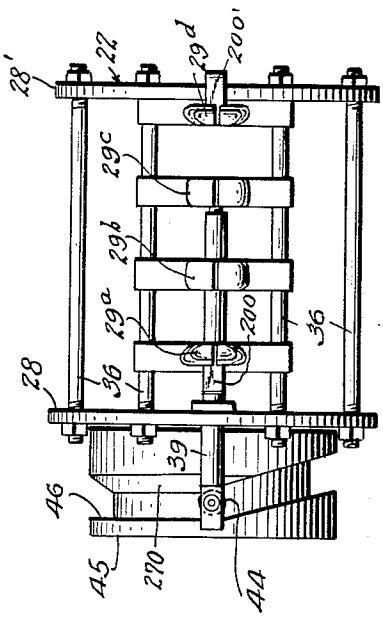


Fig. 56.

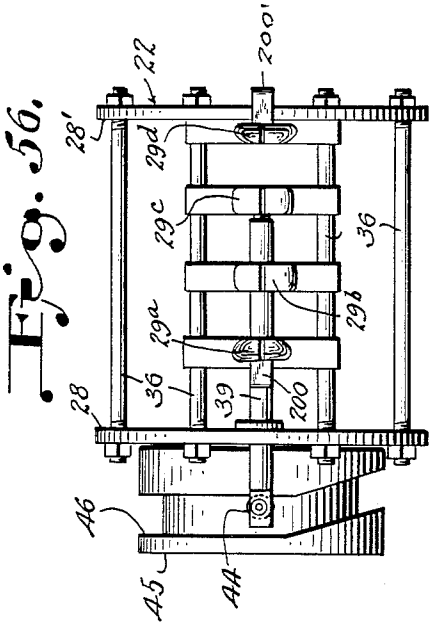
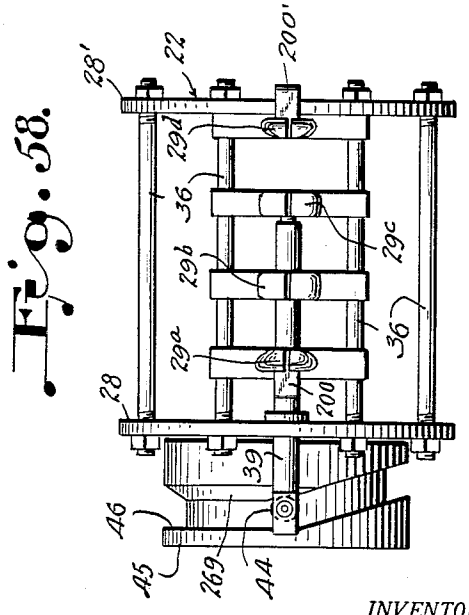


Fig. 58.



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Fig. 61.

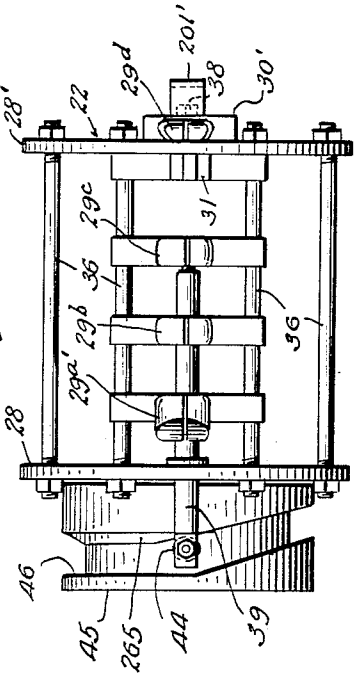


Fig. 63.

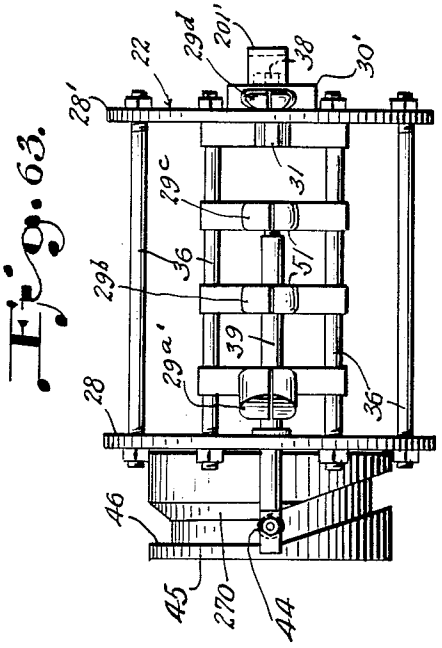


Fig. 60.

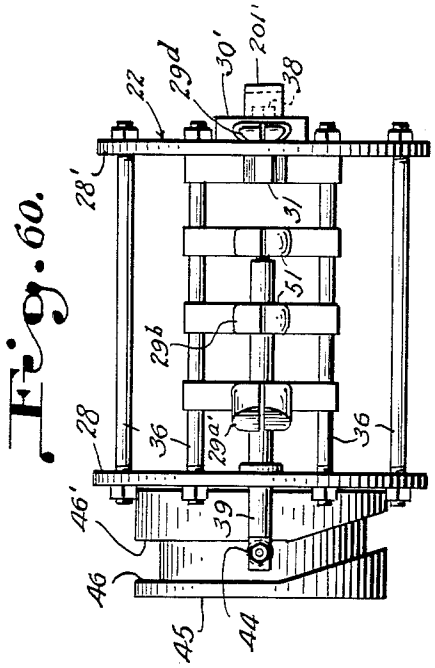
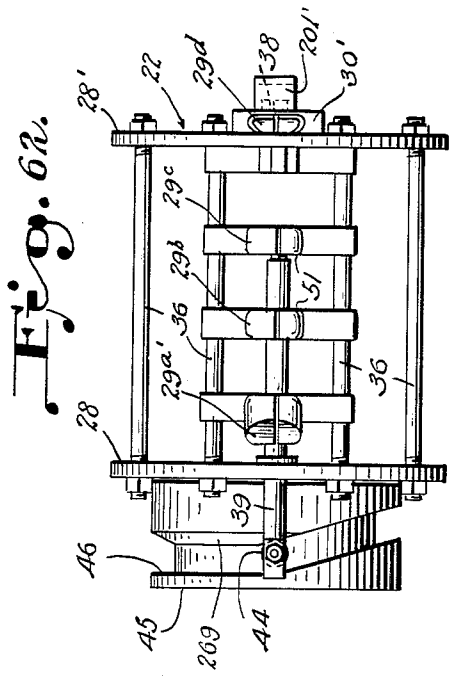


Fig. 62.



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United States Patent Office

2,727,477

Patented Dec. 20, 1955

2,727,477

BAG STRINGING MACHINE

Edward E. West, Richmond, Va.

Application July 16, 1953, Serial No. 368,460

19 Claims. (Cl. 112—2)

The present invention relates to a machine for automatically stringing netted or open mesh bags for produce and the like which constitutes an improvement over the machine of my Patent No. 2,511,658 dated June 13, 1950.

The machine of my prior patent, as well as the present machine, accomplished the stringing of open mesh type bags automatically as distinguished from the old hand methods. However, my previous machine proved unsatisfactory in some respects in that different sized bags, that is, those having varying mouth sizes and lengths, could not be strung thereon because the rotating turret head was provided with a series of four radially extending stationary bag supporting forms over which bags were sleeved, and cooperating with which were spring pressed cam actuated stretcher arms. Thus, while this structure enabled a predetermined size of bag to be strung, if it was thereafter found necessary to handle bags having larger or smaller mouths, it was necessary to dismantle the turret head and replace it by a larger or small one, depending on the size of bag it was desired to string. This, of course, resulted in the machine being out of commission for considerable periods of time due to the necessity of returning the machine to the manufacturer for rebuilding because it was impractical for the user to carry different sized turret-heads in stock. Because of the necessity of practically designing a new turret and rebuilding the machine each time a different size bag was to be strung, the user was put to considerable expense. For these principal reasons, the present machine was designed so that various sizes of bags could be strung thereon, for example, but not by way of limitation, those ranging in mouth sizes from 6½ to 12 inches and the bag mouth sizes ranging therebetween.

It is, therefore, the principal object of this invention to provide a novel and improved automatic machine for uniformly stringing varying sizes of netted or open mesh bags.

Another object is the provision of an automatic machine having adjustable means thereon for supporting bags of various sizes during the stringing thereof.

Still another object is the provision of a novel turret head having expansible members thereon for supporting bags so that the latter may be puckered and strung.

A further object is to provide a novel turret head having expansible members thereon which may be readily replaced to accommodate bags of varying sizes.

A still further object is the provision of a turret head having a series of radially extending bag supporting members arranged thereon for lateral movement relative to each other and which movements are coordinated with oscillating puckering means also mounted on the head for puckering the mouth of the bag and supporting the same during stringing.

Another object is to provide means for controlling the oscillatory movements of the puckering means proportionately to the size of bags positioned on the bag supporting members so that the pleats formed in the strung bags

will be substantially uniform as to width when the mouth ends of the bags are drawn closed.

These and other objects and advantages will be apparent as the specification is considered with the accompanying drawings, wherein;

Figure 1 is a front elevation of the complete bag stringing machine;

Figure 2 is a rear elevation of the machine;

Figure 3 is a plan view of the complete bag stringing machine, showing the relative positions of the bag supporting, stringing, knotting and bag removing mechanism;

Figure 4 is a side elevation of the complete bag stringing machine;

Figure 5 is a side elevation of the complete bag srtinging machine;

Figure 6 is a front elevation of the turret head, showing the relative positions assumed by the bag supporting and puckering members during the various operations;

Figure 7 is a rear elevation of the turret head, showing the relative positions assumed by the bag supporting and puckering members during various operations;

Figure 8 is a plan view of a portion of the machine, showing the string feeding mechanism;

Figure 9 is a section on the line 9—9 of Figure 8;

Figure 10 is an elevation, partly in section, of the string knotting mechanism and cam means for operating the same;

Figure 11 is a section on the line 11—11 of Figure 6, showing a portion of the cam and associated mechanism for actuating the bag supporting and pleating members on the turret;

Figure 12 is a side elevation of the string gripper operating mechanism, partly broken away and in section;

Figure 13 is a side elevation of the string grippers and actuating levers, showing the grippers in string receiving position;

Figure 14 is a side elevation of the string grippers and actuating levers, showing the grippers in string releasing position;

Figure 15 is a cross section hrough the string gripping jaws;

Figure 16 is a section on the line 12—12 of Figure 7;

Figure 17 is a front elevation of the needles and operating mechanism therefor;

Figure 18 is a plan view of the needles and operating mechanism therefor;

Figure 19 is a section on the line 19—19 of Figure 18, showing the needle saddle;

Figure 20 is a plan view of the knotting mechanism and associated string gatherers;

Figure 21 is a section on the line 21—21 of Figure 20, showing the gears for actuating the string gatherers;

Figure 22 is a section on the line 22—22 of Figure 1, showing the Geneva operating mechanism for the turret;

Figure 23 is a vertical view of the post for supporting the string feeding tube and the associated string tensioning mechanism;

Figure 24 is a section on the line 24—24 of Figure 23;

Figure 25 is a section on the line 25—25 of Figure 24;

Figure 26 is an enlarged cross section through the post, string feeding tube, and associated string tensioning mechanism;

Figure 27 is a vertical detailed section of the locking plate for the string tensioning pin, shown in locked position;

Figure 28 is a perspective view of a portion of the string tensioning rod;

Figure 29 is a front elevation of the string looper and a portion of the string gripping mechanism;

Figure 30 is a side elevation of the string supply and associated mechanism;

Figure 31 is a side elevation of a portion of the string gathering mechanism, associated with the knotting mechanism;

Figure 32 is a section on the line **32—32** of Figure 33 showing another portion of the string gathering mechanism;

Figure 33 is a bottom plan view of the string gathering mechanism;

Figure 34 is a side elevation of a portion of the turret, showing one of the bag supporting members;

Figure 35 is a top plan view of one of the bag supporting members;

Figure 36 is a perspective view of the narrow cam insert used when approximately 7", 9" and 11" bags are being strung;

Figure 37 is a perspective view of the wider cam insert used when approximately 7½", 9½" and 11½" bags are being strung;

Figure 38 is a perspective of the widest cam insert used when approximately 8", 10" and 12" bags are being strung;

Figure 39 is a perspective view of one of the bag supporting members;

Figure 40 is a perspective view of another bag supporting member;

Figure 41 is a perspective view of another bag supporting member;

Figure 42 is a perspective view of still another bag supporting member;

Figure 43 is a diagrammatic face view of the cam on the horizontal driven shaft for actuating the string cutting mechanism;

Figure 44 is a diagrammatic face view of the cam on the horizontal driven shaft for actuating the string gripping mechanism;

Figure 45 is a diagrammatic face view of the cam on the horizontal driven shaft for reciprocating the string feeding tube;

Figure 46 is a diagrammatic face view of the cam on the horizontal driven shaft for actuating the string clamping pin associated with the string feeding tube;

Figure 47 is a diagrammatic face view of the cam on the horizontal driven shaft for reciprocating the knotter rod during the knotting operation;

Figure 48 is a diagrammatic face view of the cam on the horizontal driven shaft for actuating the string gatherers during the knotting operation;

Figure 49 is a diagrammatic face view of the cam on the horizontal driven shaft for reciprocating the knotter pin during the knotting operation;

Figure 50 is a diagrammatic face view of the cam on the main longitudinal driven shaft for reciprocating and opening and closing the needles during the stringing operation;

Figure 51 is a diagrammatic face view of the cam on the main longitudinal driven shaft for reciprocating the needle carriage and the needles during the stringing operation;

Figure 52 is a front elevation of the turret head, three bag supporting members, and cam without cam insert in positions assumed for receiving an approximately 6½" mouth bag for stringing;

Figure 53 is a front elevation of the turret head, three bag supporting members, and cam with narrow cam insert in positions assumed for receiving an approximately 7" mouth bag for stringing;

Figure 54 is a front elevation of the turret head, three bag supporting members, and cam with wider cam insert in positions assumed for receiving an approximately 7½" mouth bag for stringing;

Figure 55 is a front elevation of the turret head, three bag supporting members, and cam with widest cam insert

in positions assumed for receiving an approximately 8" mouth bag for stringing;

Figure 56 is a front elevation of the turret head, four bag supporting members, and cam without cam insert in positions assumed for receiving an approximately 8½" mouth bag for stringing;

Figure 57 is a front elevation of the turret head, four bag supporting members, and cam with narrow cam insert in positions assumed for receiving an approximately 9" mouth bag for stringing;

Figure 58 is a front elevation of the turret head, four bag supporting members, and cam with wider cam insert in positions assumed for receiving an approximately 9½" mouth bag for stringing;

Figure 59 is a front elevation of the turret head, four bag supporting members, and cam with widest cam insert in positions assumed for receiving an approximately 10" mouth bag for stringing;

Figure 60 is a front elevation of the turret head, four bag supporting members with the first member removed and substituted by a wide member and the fourth finger removed and clamped on the outside of the turret plate, and the cam without cam insert in positions assumed for receiving an approximately 10½" mouth bag for stringing;

Figure 61 is a front elevation of the turret head, four bag supporting members with the first member removed and substituted by a wide member and the fourth member removed and clamped on the outside of the turret plate, and the cam with narrow cam insert in positions assumed for receiving an approximately 11" mouth bag for stringing;

Figure 62 is a front elevation of the turret head, four bag supporting members with the first member removed and substituted by a wide member and the fourth member removed and clamped on the outside of the turret plate, and the cam with wider cam insert in positions assumed for receiving an approximately 11½" mouth bag for stringing; and

Figure 63 is a front elevation of the turret head, four bag supporting members with the first member removed and substituted by a wide member and the fourth member removed and clamped on the outside of the turret plate, and the cam with widest cam insert in positions assumed for receiving an approximately 12" mouth bag for stringing.

Prior to considering the structural details of the machine, the general operation thereof will be chiefly discussed. The open mouth of a netted or open mesh bag is manually placed over the horizontally disposed forwardly extending series of adjustable bag supporting members of a rotating turret head having four series of radially extending bag supporting members, the bag supporting members are moved laterally adjacent one another, at the same time the bag is engaged by a series of oscillating puckering fingers, whereby the mouth of the bag is puckered or pleated preliminary to stringing; the turret head is rotated ninety degrees to carry the bag supporting members and bag to a downwardly extending vertical position where the pickered mouth is provided with a draw string and the latter is knotted; and a further ninety degree rotation of the turret delivers the strung and knotted bag to a horizontal rearwardly extending position where the bag is removed.

Referring more particularly to the drawings, wherein like reference characters designate similar parts throughout the several views, the numeral **1** denotes a main frame, mounted on a base **2**, and comprising two spaced vertical cam boxes **3** and **4**, the latter of which is divided by a wall **5** into two cam compartments **6** and **7**. Extending longitudinally through and suitably journalled in the cam box **4** is a main drive shaft **8** projecting into a conventional gear reduction box **9** supported on the frame by a bracket **10**. A worm gear, not shown, mounted on the end of shaft **8** meshes with a worm, not shown,

on a shaft 12 in gear box 9 and which shaft 12 projects therefrom and carries a pulley 14 on the outer end thereof. The pulley 14 is drivingly connected by a belt 16 to a pulley 15 carried by a shaft 17 extending from a suitable source of power, such as an electric motor 18 suitably supported on the frame. Extending transversely through and suitably journalled in the spaced cam boxes 3 and 4 is a horizontal driven shaft 19 which is arranged above and at right angles to the main driven shaft 8. The horizontal shaft 19 is drivingly connected with the shaft 8 by helical gears 20 on the shafts 8 and 19. Various driving cams and associated mechanisms, hereinafter described in detail, are mounted on the longitudinal and horizontal driven shafts 8 and 19.

Rotating bag holding turret head (Figures 1 to 4, 6, 7, 11, 16 and 52 to 62)

The purpose of this mechanism is to provide a means, such as a rotating turret head 22, having four radially extending series of expansible and adjustable bag supporting members for receiving preselected varying sizes of netted bags in a horizontal position and for intermittently rotating the bags to a downwardly depending vertical stringing position, thence to a horizontal rearwardly extending horizontal position where the strung bags are removed from the head and delivered into a stacking hopper, and thence to an upwardly extending vertical idle position, after which the head is further rotated to return the bag supporting members to the first mentioned horizontal bag receiving station in position to receive another bag for stringing. It will, of course, be understood from the following description that while one bag is being positioned by an operator on the turret head, the preceding bags are simultaneously being strung and removed therefrom, so that the turret head simultaneously accommodates three netted bags for the purposes hereinafter set forth.

The rotating bag holding turret head 22 is mounted on a horizontal shaft 23, suitably journalled in the spaced walls 24 and 25 of the cam box 4 and projecting laterally from the wall 24 adjacent the upper end thereof and the extended end of shaft 23 is journalled in the upper end 27 of an upstanding bracket 26 mounted on the upper end of cam box 3. The bag holding turret head 22 comprises two spaced annular plates or discs 28—28' carrying a series of radially extending groups of removable and adjustable bag supporting fingers 29. Each group generally consists of four fingers 29*a*, 29*b*, 29*c* and 29*d*, although, depending on the size or width of the bag being positioned thereon, only three or more fingers may be arranged thereon, as will hereinafter be described in detail. As best shown in Figure 16, each of the four fingers of the four spaced groups thereof is removably connected to upstanding extensions 31 of substantially T-shaped carrying blocks 30 by headed bolts or the like 32 which project through bores in the lower ends of the fingers and threaded bores in the extensions 31. The blocks 30 are sleeved on four pairs of spaced rods 36 extending transversely between and suitably secured by nuts 37 to the turret head plates 28—28'. The block 30, adjacent plate 28', is bolted thereto by bolt 38 so as to be fixedly mounted on the rods 36, whereas the remaining three blocks 30 of each group are slidingly arranged thereon. As each group of bag supporting fingers 29 and their supporting and operating mechanism is substantially the same, it is necessary to describe only one group thereof. Thus, one end of one of the series of four rods 39 is threadedly connected, as at 40, to the second block 30, that is, the block adjacent the one fixed to plate 28', at a point intermediate the base portion 41 thereof, and the rod 39 is sleeved through aligned bores 42 in the base portions 41 of the remaining two blocks 30. The outer end of rod 39 projects through plate 28, as at 43, and carries a cam roller 44 thereon which is seated in a relatively wide cam groove 46 formed in the annulus of a cam 45 carried by shaft 23. The cam 45 is bolted to the upper end 27 of bracket 26, as at 47, so that the turret head rotates relative to the stationary cam 45.

As will presently be described, the curvature of the cam groove 46 is such that, during rotation of the turret head, the rods 39 will be reciprocated through the plate 28 so as to move the slidably arranged blocks 31 and supporting fingers 29 toward the fixed block 31 and supporting finger 29*d*, for a purpose which will hereinafter be explained. This movement of the blocks 31 and bag supporting fingers 29 toward each other and the fixed block and finger is effected by a series of interconnected pivoted X-shaped toggle links 48. The latter intersect or cross one another and are pivoted together at their points of intersection and to the undersides of each of the blocks 31 in the centers thereof by pins 49 extending from the blocks. The outer ends of the links 48 are pivoted together, as at 50. As rod 39 is connected to the second block 31, sliding movement of the rod 39, under cam action, will push the second block 31 and, the interconnection of the blocks, will cause the latter with their supporting fingers to be moved from the spaced expanded or extended bag feeding position to the collapsed or closed bag gripping and stringing position. In other words, the interconnecting links 48 constitute a pantograph or toggle to move the blocks 31 and bag supporting fingers 29 toward and away from each other.

Referring more particularly to Figures 34 and 39 to 42, each of the bag supporting fingers 29 consists of a pair of elongated complemental finger portions 51 having upwardly and inwardly extending rounded outer bag engaging faces 52. The complemental finger portions 51 are spaced apart, as at 53, and the relatively flat opposing inner side faces 54 thereof extend from the rounded and slightly tapered upper ends 55 of the fingers downwardly and outwardly to a point substantially midway of the lengths thereof from which points the faces 54 angle outwardly, as at 56, and terminate in curved needle receiving openings 57 arranged on either side of extensions 30 to permit passage of the stringing needles therethrough. Thus, in assembled positions, the flat opposing side faces 54 of the fingers 29 are spaced apart to provide spaces 53 therebetween to permit of the ready withdrawal of the string after the latter has been inserted through the gathered mouth of the bag during the stringing operation. This is an improvement over the bag supporting forms of my Patent 2,511,658 wherein string slots were formed therein from which the string was withdrawn. However, the strings had a tendency to become entangled in the slots which left the mouth of the bag somewhat puckered and hampered removal of the bags from their supporting forms. However, in the present machine, the spaced relationship of the pairs of bag supporting fingers provides vertically disposed openings therebetween so that ready withdrawal of the string is assured.

The bag holding turret head is intermittently rotated to carry the bag holding members to the various stations, by means of a Geneva mechanism. A Geneva gear 58 (Figure 22) keyed to one end of the turret head shaft 23, is formed with radial portions 59, four in number, separated by radial slots or grooves 60. Cooperating with this Geneva gear 58 is a circular disc 61, cut away at 62, and having a radially disposed arm 63 provided with a Geneva driving pin 64. The disc 61 is mounted on a horizontal shaft 65 journalled in the spaced walls 24 and 25 of the cam box 4. The shaft 65 is rotated by a sprocket chain 66 (Figures 2 and 3) which travels over sprockets 67 and 68 on the shaft 65 and the horizontal driven shaft 19, respectively. As the horizontal shaft 19 is geared to the main longitudinal shaft 8, it will be seen that normally the circular periphery of disc 61 engages one of the arc-shaped sectors 59 of the Geneva gear 58 and, once in each rotation of the shaft 65, the Geneva pin 64 will engage one of the radial slots 60 and move the Geneva

gear 58 one quarter of a turn. Each step by step movement imparted to Geneva gear 58 causes the turret head to rotate one quarter of a revolution thus moving the first bag receiving members 29 from a horizontal to a downwardly depending or vertical stringing position, and thence to a horizontal delivering station, and finally to an upwardly extending vertical or idle position.

Puckering or pleating pins 69 are associated with each group of bag supporting fingers 29 for engaging with a bag positioned thereover and causing the mouth end thereof to be puckered or pleated in such a manner that the stringing needles enter and deliver a string through the pleated portions of the bag. As best shown in Figures 6 and 7, a series of six pins 69 are associated with each group of supporting fingers 29 and are interposed therebetween on opposing sides thereof for movement relative thereto, as will presently be described. Beginning at a point intermediate their ends, the pins 69 are flattened, as at 70, and the upper ends are bent outwardly, as at 71, and have somewhat pointed outer ends 72. As best shown in Figure 7, the lower ends 73 of the pins project through and act as pivots for the overlapping ends 74 and 75 of a series of interconnected links 76 and 77. The opposing ends of links 76 and 77 are pivotally connected, as at 78, to downwardly extending bosses 79 on the undersides of the bag finger carrying blocks 30. As the lower ends of the pins 69 are fixedly secured to the ends 75 of links 77, it will be apparent that pivotal movements of the links 76 and 77 will move the pins 69 inwardly in opposing directions towards each other so that the mouth of a bag positioned on the bag supporting fingers 29 will be puckered or pleated, as will hereinafter be described in detail. Thus, it will be understood that, as the links 76 and 77 are pivoted to each other and to the bag finger carrying blocks 31, as are the links 48, rotation of the turret head causes the cam groove 46 to impart inward lateral movement to the blocks 31 and bag supporting fingers 29 which simultaneously moves the pins 69 to effect puckering or pleating of the bag.

A netted or mesh bag, not shown, is positioned on the turret head by the machine operator grasping the same and inserting the open mouth thereof over the horizontally disposed bag supporting fingers 29 and pushing the same therealong until the end of the bag abuts the metal stops 200, Figures 1–3 and 7, respectively, secured to the sides of one of the outermost blocks 30 and turret plate 28'. As the bag supporting fingers 29 are in their expanded or widest position when the bag is sleeved thereover, the bag will be snugly engaged by the fingers 29 and thereby retained thereon prior to the puckering and stringing operations.

In the downwardly extending vertical position of the bag supporting fingers 29, the mouth end of the bag will be aligned with a pair of parallel horizontally disposed needles 81. The needles, together with their operating mechanism which are particularly shown and described in my tobacco bag stringing patents Reissue 22,596, 2,367,986, 2,486,350, and my previously mentioned Patent 2,511,658, are provided with a draw string and are operated in much the same manner and by the same mechanism disclosed in my prior patents and, therefore, detailed drawings and description of the needles and operating parts will be dispensed with. Suffice to say, the needles, as best shown in Figures 17, 18 and 19, comprise pointed shank members 81 reciprocably mounted in tubular sleeve members 82 for opening and closing the needle jaws 83, formed by the ends 84 of the sleeves and the rear faces 86 of the pointed ends 85 of the pair of needles 81, and clamping the ends of a draw string 118 therein. The needles are rigidly supported at their rear ends by and are fixed in a needle saddle 89 suitably secured to the top of a needle carriage 90. The needle carriage is provided with laterally extending side flanges 91 which interfit in grooves 93 (see Figure 19) formed in a pair of spaced parallel tracks 92 fixed to the upperside of a flat top plate 94 mounted on and suitably secured to supporting brackets 95 carried by the cam box walls 24 and 25. The rear ends of the pointed shank members 81 are fixed in a small block 96, suitably mounted on the carriage 90 for slight sliding movement relative thereto. Block 96 is inwardly actuated against the tension of springs 97 mounted on posts 98 by means of a small cam 99 carried by one arm 101 of a crank 100. The arm 101 is rotatably mounted in a block 102 mounted on the needle carriage 90. The other arm 103 of crank 100 carries a roller 104 periodically actuated by a horizontally disposed arm 105 which is pivotally mounted on the top plate 94 by links 106—106' so that the arm is vertically movable relative to the plate 94 as presently described. The needle carriage is reciprocated back and forth by the action of a suitably actuated arm 107, in turn pivoted at its one end to the rear end of the carriage block 102, and the outer end of the arm 107 is pivoted to the upper end of a vertically disposed lever 108 (Figure 5) which is pivotally mounted at its lower end, as at 109, to the machine frame. A cam roller 110 (see Figures 1, 2 and 3) is mounted on the lever 108 and rides in a cam groove 112 in the side face of a cam 111 mounted on the main longitudinal driven shaft 8. The curvature of the cam groove 112, as shown in Figure 51, is such that as the cam is rotated, the roller 110 will be acted upon and the lever 108 and arm 107 will be rocked and the needle carriage 90 reciprocated. During the reciprocation of the needle carriage, the needles are moved to open and closed positions to receive and clamp a draw string and thereafter release the same after the string has been delivered through the bag by the needles by the action of the horizontally disposed arm 105 on the crank 100. The arm 105 is raised and lowered by means of an offset arm 113 (see Figures 2 and 5) connected to the upper end of a vertical lever 114 which is journalled on the frame, as at 114'. A cam roller 116, carried by the lower end of lever 114, rides on the periphery of a cam 115 (Figures 5 and 50) on driven shaft 8. The curvature of the cam 115 is such that rotation of the cam 115 causes the lever 114 to be vertically moved and the arm 105 to be raised and lowered to open and close the needles.

With a bag positioned on a series of bag supporting fingers at the horizontal station, the turret head is rotated to move the bag to the downwardly extending vertical stringing station, during which movement the fingers 29 are moved laterally to closed or retracted positions and the puckering pins 69 are simultaneously actuated inwardly so as to engage and force the bag material into the spaces between the retracted fingers 29 and cause puckers or pleats to be formed in the sides of the bag. The needles 81 are then brought into play and, on the forward stroke of the needle carriage, the pointed shanks 82 thereof pass through the netted material of the bag and thence through the needle openings 57 in bag finger portions 51 and the puckers or pleats in the bag mouth. In other words, each needle 81 passes through each side of the bag and passes out the opposite side thereof. After the needles have passed through the bag mouth on the forward stroke, it is necessary to feed a string into the needle jaws so that the string will be drawn through the bag on the rearward stroke of the needles. Thus, as best shown in Figures 3, 8 and 23 to 27, an arcuately shaped horizontally disposed string feeding guide tube 117, through which extends the string 118 drawn from a string supply spool 200 (Figure 30) is fixedly mounted adjacent its rear end in an upstanding post 119 carried by a crank arm 120 (Figure 8) pivoted to the frame, as at 121 (Figure 4). The crank arm 120 is pivotally connected by a link 122 to the upper end of a vertical lever 123 (Figure 9) fulcrumed on a shaft 124 in the cam box 3. The lever 123 is formed with a crank arm 125 (Figure 8) carrying a cam roller on the end thereof which rides in a cam groove 128 in one side face of a cam 127 (Figures 8 and 45) mounted on the horizontal driven shaft 19. The curvature of

the cam groove 128 is such that rotation of the cam 127 rocks the lever 123 and swings the string tube 117 through an arc and reciprocates the same through two spaced guide blocks 129 on a top supporting plate 130, suitably mounted on the upper end of the cam box 3, and across the path of the needles 81 to carry the string across into position to be gripped by a string gripper 131 (Figure 11). During the reciprocation of the string guide tube 117 across the path of the needles, the former pass through aligned slotted openings 133 (Figure 8) in the needle guide blocks 129. A pair of longitudinal openings 134 are also formed in the guide blocks 129 for the guiding of the needles 81.

As the string 118 in the arcuate guide tube 117 has a tendency to slip therein during the feeding of the string to the needles and while being severed by the string cutter, means is provided for applying varying degrees of tension to the string to prevent the same slipping relative to the tube during the aforesaid operations. Thus, a horizontally disposed string tension pin 135 (Figures 23 to 27) projects through an opening 137 in a bracket 136 secured, as at 138, to the side of post 119. The inner end of the pin 135 projects through aligned transverse bores 139 and 140 in the post 119 and string tube 117 and its end is beveled or slightly rounded, as at 141, so as to frictionally engage the string within tube 117 and prevent it from slipping relative to the tube. The beveled end 141 of pin 135 permits of the string passing thereover and the somewhat flattened portion 142 of the beveled face 141 serves to apply tension to the string so that the latter is prevented from kinking or ravelling up outside of the tube which would tend to impede the free feeding of the string to the needles. A small spring 143, sleeved on the pin 135 between the bracket 136 and a plate 144 welded or otherwise secured to the pin intermediate the post and bracket, normally places the pin under slight compression so that the beveled inner end 141 thereof applies just enough tension to the string 118 to prevent it from slipping within the tube 117 during the feeding thereof to the needles. The plate 144 is formed with two legs 145 depending downwardly from the sides thereof which engage the edges of the bracket 136 and tend to hold the pin in alignment with the bores 139 and 140 in the post 119 and tube 117. One of the legs 145 is adapted to fit within a notch 146 in the edge of bracket 136 when the operator pulls on and slightly twists the pin 135 which serves to hold the beveled end 141 of the pin out of engagement with the string 118 in tube 117 so that the string may be adjusted within the tube.

In addition to the pin 135 being retained under spring pressure during the delivery of the string to the needles, the outer end thereof is beveled, as at 147, so as ride over the face 149 of a laterally extending relatively flat twisted spring plate 148 (Figures 2, 3, 8 and 9) secured by screws or the like 151 to a bushing 150 fixedly mounted on a vertically extending rod 152 projecting through an opening 153 in the covering plate for the cam box 3. The rod 152 extends downwardly through spaced bearings 154 on the side wall of cam box 3 and is formed with a cam roller 155 on its lower end which is adapted to ride on the periphery 157 of a cam 156 (Figures 9 and 46) on shaft 19. A spring 158, sleeved on rod 152 bears against the upper bearing 154 and a collar 159 fixedly mounted on the rod, serves to retain the cam roller 155 in engagement with the cam periphery 157 and the latter is formed with a bump 160 thereon so that during rotation of the cam 156 the bump 160 pushes the rod 152 upwardly and the twisted plate 148 is caused to bear against the beveled outer end 147 of pin 135 to force the latter inwardly so that the inner end 141 thereof is caused to clamp the string 118 in the tube 117 in timed relation with the cutting action of a string cutter 186, hereinafter described. Thus, after the string has been clamped in the needle eyes, the string may be cleanly severed because the string is clamped in its feeding tube, as above described, and there is no likelihood of the severed string ends becoming ravelled, and frayed.

The string gripper 131 and associated operating mechanism is substantially the same as that shown and described in my Bag Making, Stringing and Tagging Machine, Reissue Patent 22,596 and my Bag Stringing Machine Patent 2,511,658, so it is not believed necessary to describe and illustrate the same in detail herein. Suffice to say, the gripper 131 (Figures 4, 6, 7, 8 and 11) includes a pair of upper and lower gripping jaws 161 and 162 having coacting serrated gripping faces 162', as best shown in Figures 11 to 15. The lower jaw 162 is fixedly secured to the inner end of a hollow shaft 163 sleeved over a shaft 164, with the hollow shaft 163 in turn journalled within a bearing block 165 on the plate 130, and the upper jaw is fixedly secured to the inner end of shaft 163. Two downwardly extending levers 131' and 131'' (Figure 11) having oppositely extending hooked lower ends, are fixedly connected to the outer ends of shafts 163 and 164, respectively, by means of screws, not shown, and the levers are normally retained in spaced apart relationship, as shown in Figures 11 and 12, by a spring 167 (Figures 6 and 11). The hooked lower ends of the levers 131'—131'' extend into a slot 170 in the upper end 169 of a T-shaped block 168 (Figures 11 and 12) and, respectively, engage with pins 171 and 171' mounted in slot 170 of block 168. The downwardly depending leg 172 of block 168 is mounted, as at 174, on an arm 173 and the latter is pivotally connected to the bent outer end 176 of a vertical lever 175 (Figures 4, 6, 8 and 9) extending through an opening 177 in the wall of the cam box 3. The lever 175 is fulcrumed on the shaft 124 and is formed with an arm 178 (Figure 8) which carries a roller 179 positioned and riding in a cam groove 181 of a cam 180 (see Figures 3, 8 and 44) mounted on the horizontal driven shaft 19, and the contour of the cam groove is such that, during each rotation of the cam, the block 168 is reciprocated to actuate the gripping jaws. A stop pin 182 (Figure 12) mounted in the end of bearing block 165 extends into and coacts with notches 183 and 184 in the upper and lower gripping jaws 161 and 162. Thus, when the block 165 is pushed forwardly, the pin 182 rocks the lever 131' and the shaft 164 so that the upper jaw 161 is elevated to raised open Figure 13 position relative to the lower jaw 163, during which movement of the jaw 161, the stop pin 182 will act as a stop and prevent upward movement of the lower jaw 163, in an obvious manner. When the upper gripping jaw 161 has been raised to open position, the string guide tube 117 will be swung forwardly to a position adjacent the gripping jaws and the string 118, projecting from the end thereof, will be projected into the open jaws. Continued rotation of the cam 180 results in the block 168 being reciprocated rearwardly which moves the pin 171 rearwardly so that the action of spring 167 rocks the lever 131' and shaft 164 rearwardly so that the upper jaw 161 is lowered to string gripping Figure 15 position relative to the lower jaw 162 and the end of the string 118 is gripped by the jaws. When the string tube 117 has been retracted across the path of the needles, the string drawn outwardly in the form of a loop, the needles brought into position and the needle jaws 83 thereof opened, and the cutter moved downwardly to press the string into the jaws of the needles, as presently described, the continued rearward movement of block 168 causes the pin 171' to rock the lever 131'' and shaft 164 rearwardly so that the lower jaw 162 is rocked downwardly away from the upper jaw 161, as best shown in Figure 14. During this movement of the lower jaw 162, the stop pin 182 bears against and holds the upper jaw 161 stationary, so that the string is released by the jaws simultaneously with which movement the needle jaws close on and clamp the string.

A cutter rod 185 lying approximately parallel with the string guide tube 117 is journalled in the spaced

blocks **129** on plate **130**, as best shown in Figures 8 and 11. The forward end of the rod **185** is provided with a laterally extending cutter blade **186** which coacts with a stationary blade **186'** secured to one side of one of the needle guide blocks **132** on plate **130** in cutting the string fed across the needles by guide tube **117**, after the string has been gripped by gripper **131** and pulled outwardly by a bent string hook **189** formed on the upper end of a vertical lever **188** best shown in Figure 29. The lever **188** extends through an elongated guide slot **191** in a bracket **190** (Figure 3) secured to the side of the cam box **3**, and is pivoted at its lower end, as at **192** (Figure 1) to the machine frame, and is pivotally connected intermediate its ends to a rod **193** which in turn is pivoted to the vertical needle saddle actuating lever **108**. Thus, the lever **188** and string hook **189** are reciprocated simultaneously with the lever **108** and needle saddle so that the hook **189** is moved laterally in a clockwise direction, viewing Figure 1, and engages with the string **118** intermediate the needle jaws **83**, whereupon movement of the lever **188** in the opposing direction pulls the string outwardly to form a loop. The cutter rod **185** (Figure 8) is rocked in its bearings to move the cutter blade **186** downwardly into cutting engagement with the fixed blade **186'** to sever the string by means of a bent lever **195** which is connected at its upper end to a crank **194** fixedly secured to the cutter rod **185**. The lower end of lever **195** is pivoted to the outer end of an arm **196** (Figure 8) positioned in cam box **3** and which arm is fulcrumed, as at **197**, to the cam box wall. A roller **196'**, carried by arm **196**, engages with and rides in a cam groove **199** in the face of a cam **198** (see Figures 8 and 43) mounted on the horizontal driven shaft **19**. The curvature of the cam groove **199** is such that the lever **195** and crank **194** are rocked to actuate the cutter rod **185** to sever the string **118**.

As best shown in Figure 30, the string supply spool **200** is mounted on a laterally extending rod **201** connected to an upright supporting post **202** which is preferably arranged adjacent the machine. The string **118** is spirally wound on the spool **200**, in a conventional manner, and the end thereof projects through a circular wire ring **203** formed on the end of a vertical wire **204** suspended, as at **205**, from the outer end of a laterally extending rod **206** connected to the upper end of post **202**. The wire ring **203** is aligned with and spaced from the outer end of spool **200** so that, as the string is withdrawn from the spool, the frictional engagement of the string with the wire ring **203** in its passage therethrough will tend to prevent the string from flopping around and becoming entangled on the spool. In this connection, it will be apparent that should the string become so entangled, it will preclude the string tube **117** from properly feeding the string through the needles and into the gripper **131**. After passing through ring **203**, the string **118** feeds through the wide end **208** of a hollow elongated tapered cone **207** (Figures 3 and 8) supported in a substantially horizontal and slightly downwardly disposed position by an upstanding bracket **210** connected to cam box **3**. The cone **207** tapers from the end **208** to a reduced or smaller inner end **209** and the string **118** thereafter feeds through a wire guide ring **211** (Figures 3 and 8) supported on the top frame plate. As the string **118** is spirally wound on supply spool **200**, it follows that a swirling action will be imparted thereto during the unwinding thereof. This action would have a tendency to interfere with the proper feeding of the string by the tube **117**, which is overcome by the feeding of the string through cone **207**. Thus, as the string feeds through the latter from the wide to the reduced ends thereof the cone **207** will so confine the string that it will be feeding in a more or less straight line by the time it passes through the reduced inner end **209** thereof so that the tube **117** will accurately and uniformly feed the string, as previously described.

When the string has been gripped by gripper **131** and the string guide tube **117** retracted across the path of the needles **81**, the bent string hook **189** will draw the string outwardly to provide the necessary length of string. During this operation, the needles have reached the end of their forward stroke and the jaws **83** thereof are opened and positioned in alignment with the string guide tube **117** and string gripper **131**, at which time the gripper and cutter **186** simultaneously move downwardly a relatively short distance thereby carrying or placing the string in the open jaws **83** of the needles, at which time the needles are actuated to cause the jaws **83** to close upon and grip the string and the cutter blade **186** is actuated to engage the stationary blade **186'** and the string is severed or sheared. During this movement, the gripper **131** is actuated to free or disengage the string. The needles are now in position to move rearwardly and carry the string through the bag into position to be acted upon by a string knotter **212** for knotting the free ends of the string.

The knotter mechanism generally resembles one of the knotters described and illustrated in my bag stringing machine patents Reissue 22,596 and 2,374,572, and is substantially the same as that embodied in my Patent 2,511,658. Suffice to say that the knotter **212**, as best shown in Figures 10 and 20, comprises a hollow knotter rod **213** slidably positioned within a bearing block **214** secured to the flat needle guide track supporting plate **94**. The inner end of the knotter rod **213** is formed with a curved pointed hook **215** which serves to engage the string and wind or loop the same around the head or inner end of rod **213** during the knotting operation.

The knotter rod **213** is rotated by means of gear teeth **216**, formed on the knotter rod **213**, which mesh with a horizontally disposed rack bar **217** (Figures 1, 10 and 20). The rack bar **217** slidably extends through the upper end of the block **214** and is pivotally connected to the upper end of a vertical lever **218** fulcrumed intermediate its ends to the machine frame. A cam roller **219**, mounted on the lower end of lever **218**, rides in a cam groove **220** in the cam **115** (Figures 3 and 50) carried by the main longitudinal driven shaft **8**, so that the lever **218** is rocked to actuate the rack bar **217** and rotate the knotter rod **213** to form the loop of the knot.

The knotter rod **213** is reciprocated through the bearing block **214** to advance the hook **215** into position adjacent to and in engagement with the string **118** positioned in the needles, and then to withdraw the string outwardly, while being rotated, so that the rod will loop or wind the string around the head thereof. This reciprocation of the rod **213** is accomplished by a vertically disposed lever **221** pivotally connected at its upper end to the knotter rod **213**. The lever **221** (Figures 3 and 10) is mounted on a bushing **223** fixed on a stub shaft **222** journalled in the walls **24—25** of the cam box **4**. A lever **224** fixed on shaft **222** has a roller **225** on the lower end thereof which rides in a cam groove **227** in the side face of a cam **226** (Figures 2, 3 and 47) mounted on the horizontal driven shaft **19**. Rotation of the cam **226** rocks the lever **224** and reciprocates the knotter rod **213** forwardly and rearwardly in bearing **214**. At the end of the forward stroke, the hooked end **215** of the knotter rod will engage with and hook the string **118** adjacent the ends thereof in the needles and the rod will be retracted.

In order to assure of the hooked end **215** of the knotter rod engaging with and hooking both ends of the string, adjacent the ends thereof, two spaced pairs of downwardly depending scissors-like string gatherers or clamps **228** (Figures 10, 24, and 31–33) are arranged on the sides the knotter rod **213**. As best shown in Figures 31 and 32, each string gatherer **228** embodies a pair of movable fingers **229—229'** carried by a pair of shafts **230—230'** journalled in a block **231** attached to the inner wall **25** of the cam box **4**. The lower ends of the

fingers 229—229' are provided with string engaging recesses 232—232' and the shafts 230—230' are drivingly connected together by gears 233 (Figures 10, 20, 21 and 33) arranged in the block 231. The end of one shaft 230 projects through the cam box wall 25 and is provided with an upwardly extending arm 234 (see Figure 2) pivoted at its upper end to a link 235, the other end of which is pivoted to the upper end of a vertical lever 236. As shown in Figure 2, the lever 236 is fulcrumed on a stub shaft 237 in the walls 24—25 of the cam box 4, and the lower end of the lever 236 carries a cam roller 238 which rides in a cam groove 240 in the side face of a cam 239 (Figures 2, 3 and 48) on the horizontal driven shaft 19. Thus, it will be understood that the string recesses 232—232' of the fingers 229—229' engage the string 118 and, upon rocking of the fingers 229—229', as described above, are caused to gather or draw the string together to assure of the same being engaged and hooked by the knotter hook 215 adjacent their ends. During the return stroke of the rod 213, the latter is rotated, in the manner described in my previously mentioned Reissue Patent 22,596 whereby the string is wound around the head of the knotter.

Knotter pin 241 slidably but non-rotatably extends through the hollow knotter rod 213 and is formed with a curved inner end 242 (Figure 20). The knotter pin 241 is slidably connected at its upper end to the upper end of a vertically disposed lever 243 (Figures 3 and 10) fixedly secured to the end of a stub shaft 244 journalled in the walls 24—25 of cam box 4 parallel to stub shaft 232. An arm 245 fixed on stub shaft 244 has a roller 246 on the end thereof which rides in a cam groove 248 in the side face of a cam 247 (Figures 3 and 49) mounted on the horizontal driven shaft 19. The curvature of the cam groove 248 is such that the lever 243 is rocked and the knotter pin 241 reciprocated through the knotter rod 213 so that the curved end 242 thereon engages the string and rearwardly draws the ends thereof through the loops formed on the head of the knotter rod 213 thereby completing the formation of the knot. During the knotting operation, the needle jaws are actuated to open position to release the ends of the strings and the stringing and knotting is completed.

Upon completion of the stringing and knotting operations, the turret head is further rotated one quarter of a revolution to move the bag supporting fingers 29 and strung bag to a horizontal releasing and removing station. During this rotation of the turret head, the cam 45 exerts a pull on the rod 39 which in turn causes the series of interconnecting links 48 and 76—77 to move laterally from the fully closed or collapsed positions they assumed at the stringing station to partially open or extended positions so that the bag carrying fingers 29 are correspondingly moved laterally to partially extended positions and the puckering or pleating pins 69 are rocked outwardly in opposing directions. This movement of the fingers 29 and pins 69 leaves the strung bag somewhat loosely positioned on the supporting fingers 29 so that the bag may be engaged by a bag removing member 249 (Figures 1–3) which removes the same from the fingers 29 and delivers it into a hopper 250 where the strung bags are arranged in a stack of a predetermined number of bags preparatory to being stored or filled.

The bag removing member 249 comprises a pair of spaced downwardly and forwardly extending arms 251 carried by a shaft 252 journalled in the cam box walls 3' and 3''. The arms 251 are connected by a cross rod 253 and the outer ends are bent, and pointed as at 254 and 255. The end of shaft 252 extending through cam box wall 3' carries a gear 256 which meshes with an upwardly extending rack bar 257 (Figure 9) having a roller 258 thereon which rides in a cam groove 259 in the side face of cam 156 (Figure 46) on the horizontal driven shaft 19. The lower end of rack bar 257 is slotted so as to encircle shaft 19 and an idler roller 261 journalled on a stub shaft 260 in the cam box wall 3' rides on the smooth face of rack 257 and serves to hold the same in engagement with gear 256. The curvature of the cam groove 259 is such that rotation of cam 156 will rotate shaft 252 and rock the bag removing member 249 upwardly and arcuately so that the pointed ends 255 of the same will engage and pierce the netted bag depending downwardly from the bag supporting fingers 29. Continued travel of the member 249 will pull the bag from the fingers 29 and will carry the same upwardly and rearwardly and cause the bag to be flatly positioned within the open ended hopper 250, arranged on the rear end of the frame. The cross rod 253 extending across the pointed ends of arms 251 just below the points 255 thereof serves as an additional support for the bag during the aforesaid removal operation and prevents the pointed ends from becoming entangled in the netted bag material so that the bag is freely positioned within hopper 250.

After the bag is removed from the rearwardly extending horizontally disposed bag supporting fingers 29, rotation of the turret head moves the same to the vertical idle position, preparatory to being rotated through another approximately ninety degrees into the horizontal bag receiving position. During this movement of the turret head from the bag removing to the vertical idle position, cam action will exert a further pull on the rod 39 so that the fingers 29 and pleating and puckering pins 69 will assume their respective fully extended positions. As the turret head rotates to carry the fingers 29 to the forwardly extending horizontal bag feeding station, the curvature of the cam groove 46 is such that a further pull will be exerted on the rod 39 so that the bag supporting fingers 29 and puckering or pleating pins 69, through their respective actuating linkages, will be moved to their fully extended and expanded positions preparatory to a bag being positioned thereon. Thus, it will be noted that, in the horizontal bag positioning station, the fingers 29 and pins 69 are in their extended positions and, upon rotation of the turret to the successive bag stringing and knotting, bag removing, and idle positions, the fingers 29 and pins 69 are respectively and successively moved to the fully closed and collapsed stringing positions, partially opened and expanded bag removing positions, and further opened and expanded idle positions.

As previously described, the bag supporting fingers 29 are removably and replaceably arranged on the turret head so as to accommodate bags of varying widths, ranging, for example, from approximately a 6½ inch mouth bag to approximately a 12 inch mouth bag. For the smaller size mouth bags from 6½ inches through 8 inches, it is only necessary to utilize groups of three bag supporting fingers 29 on the turret head. Thus, as illustrated in Figures 52 to 55, the complemental finger portions 51 of the bag supporting fingers 29*a* and the bag stops 200' are removed from their T-shaped carrying blocks 30 so that only the groups of bag supporting fingers 29*b*, 29*c* and 29*d* remain on the turret. The stops 200' are then arranged on the blocks 30 supporting the fingers 29*b*. As previously described, the curvature of the cam groove 46 of turret cam 45 is such that during rotation of the turret the cam rollers 44 on the extended ends of rods 39 are acted upon to reciprocate the rods 39 laterally to effect lateral adjustment of the fingers 29. Thus, to accommodate the smallest mouth bag, that is approximately 6½ inches, the cam groove 46 will act on the rollers 44 to move the rods 39 sufficiently to enable such a bag to be sleeved over the bag supporting fingers 29*b*, 29*c* and 29*d*. On the other hand, the next size or width of bag, approximately 7 inches, necessitates a slightly greater lateral adjustment of the fingers which is effected by removably bolting or otherwise securing, as at 266, a relatively narrow and thin arcuate shaped cam plate 265 (Figures 36 and 53) to the inner side of the cam groove 46 at the widest portion 46' thereof. The bolt holes are, of course, countersunk so that the heads of

the bolts **266** are flush with the outer face **267** of the cam plate **265** and the outer ends thereof are tapered, as at **268**, so that cam rollers **44** and rods are caused to move a greater distance, in an obvious manner. In the case of a 7½ inch bag, the cam plate **265** is removed and a somewhat thicker and similarly shaped arcuate cam plate **269** (Figures 37 and 54) is bolted to the side of cam groove **46** so that the rods and supporting fingers will be moved a corresponding greater distance laterally. Where it is desired to handle 8 inch bags, the cam plate **269** is removed and substituted therefor is a still thicker correspondingly shaped arcuate cam plate **270** (Figures **38** and 55), which results in the rods and fingers being laterally adjusted a maximum distance to accommodate such bags.

As best shown in Figures 56 to 59, for the next group of bags, ringing in bag mouth sizes from 8½ to 10 inches, it is necessary to reassemble the bag supporting fingers **29***a* on their carrying blocks **30** so that there will be groups of four fingers **29***a*, **29***b*, **29***c* and **29***d*. It will, of course, be understood that the bag stops **200'** are reassembled on the blocks **30** for the fingers **29***a*. With this exception, the description applying to the relationship of the bag supporting fingers and the cam groove **46** and associated cam plates **265**, **269** and **270** for handling 6½ to 8 inch bags, respectively, will be equally applicable to the construction now being considered. That is to say, an 8½ inch bag may be sleeved over the supporting fingers **29***a* to **29***d* and the latter will be adequately adjusted laterally by the action of the cam groove **46** on rollers **44**. For the next sizes or 9, 9½ and 10 inch bags, it will be necessary to mount the cam plates **265**, **269** and **270**, respectively, for these respective sized bags. In other words, the thin plate **265** will be used for 9 inch bags, thicker plate **269** for 9½ inch bags, and the thickest plate **270** for 10 inch bags.

Having discussed the handling of bags from 6½ to 10 inches in width, reference will now be had to Figures 60 to 63 wherein the bag supporting fingers **29***a* to **29***d* are somewhat rearranged to accommodate the widest bags, ranging from 10½ to 12 inches in width. The complemental portions **51** of bag supporting fingers **29***a* are removed from their carrying blocks **30** and are replaced by supporting fingers **29***a'* comprising similarly shaped but wider complemental portions **51'** (Figures 34 and 35). In addition, the bag stop **201'** is removed from the turret plate **28'** and the fingers **29***d* are disassembled from their carrying blocks **30**. Another T-shaped block **30'** (Figure 34) generally corresponding in shape with the blocks **30**, is secured to the outside of plate **28'** by the bolt **38** and bolts **38'**. The fingers **29***d* and the stops **201'** are thereafter reassembled on the blocks **30'** so as to be disposed on the outside of plate **28'**. Thus, it will be apparent that the substitution of the wider fingers **29***a'* for fingers **29***a* and the rearrangement of fingers **29***d* present much wider supports for bags from 10½ to 12 inches in size. With the foregoing revisions in mind, it will be understood that only the fingers **29***a'*, **29***b*, **29***c* and relocated **29***d* are used, without a cam plate (Figure 56), to accommodate 10½ inch bags, whereas the cam plates **265**, **269** and **270**, respectively, are utilized for the larger bags 11, 11½ and 12 inches, respectively, as shown in Figures 61, 62 and 63, respectively.

Although a quantity of bags of one particular size are usually strung on the machine at one time, it will be appreciated that the machine may be readily adjusted, as hereinabove described, to string bags of varying sizes and weights. The only adjustments that are required are to add or vary the size of cam plates in cam groove **46**, and to remove, add, or rearrange the bag supporting fingers on the turret which operations are relatively simple, require little time, and can be performed by more or less unskilled workers.

After the bag is removed from the rearwardly extending horizontally disposed bag supporting fingers **29**, rotation of the turret head moves the fingers to the vertical or idle position, preparatory to being rotated through another approximately ninety degrees into the horizontal bag receiving position. As the turret head and associated puckering, stringing, knotting and bag removing operations are synchronized and function in timed relation with each other, it will be apparent that while the operator is placing one bag on a set of bag supporting fingers, the preceding bags are being respectively removed from the bag fingers and strung, so that the three main operations of applying and puckering or pleating a bag, stringing and knotting, and removing a strung bag are taking place simultaneously.

While I have illustrated and described a preferred form of my bag stringing machine, it will be understood that various changes and improvements may be made therein without departing from the scope and spirit of the appended claims.

Having thus described my invention what I claim is:

1. A machine for stringing bags comprising a rotatable bag holder having a plurality of spaced radial bag supporting members thereon for simultaneously supporting a plurality of bags, each of said members including a series of spaced fingers mounted for lateral movement thereon from spaced apart to collapsed positions, means associated with said supporting members for moving said fingers relative to each other, puckering means interposed and movable between said fingers for puckering the bag, stringing needles and needle operating mechanism for entering the needles through the puckered portion of said bag, means for threading said needles with string, means for knotting the ends of said string, and means for removing the strung bag from said bag holder, all of said means being synchronized and operable in timed relation with each other during the operation of the machine.

2. A machine for stringing bags comprising a rotatable bag holder having a plurality of spaced radial bag supporting members thereon for simultaneously supporting a plurality of bags, each of said members including a series of spaced fingers slidably mounted for lateral movement thereon from spaced apart to collapsed positions, means associated with said supporting members for moving said fingers relative to each other, puckering pins interposed and movable between and coacting with said spaced fingers for puckering the bag, stringing needles and needle operating mechanism for entering the needles through the puckered portion of said bag, means for threading said needles with string, means for knotting the ends of said string, and means for removing the strung bag from said bag holder, all of said means being synchronized and operable in timed relation with each other during the operation of the machine.

3. A machine for stringing bags comprising a rotatable bag holder having a plurality of spaced radial bag supporting members thereon for simultaneously supporting a plurality of bags, each of said members including a series of spaced elongated fingers slidably mounted for lateral movement thereon from spaced apart to collapsed positions, means associated with said supporting members for moving said fingers relative to each other, puckering pins supported on said holder between said fingers and movable therewith for puckering the bag, stringing needles and needle operating mechanism for entering the needles through the puckered portion of said bag, means for threading said needles with string, means for knotting the ends of said string and means for removing the strung bag from said bag holder, all of said means being synchronized and operable in timed relation with each other during the operation of the machine.

4. A machine for stringing bags comprising a rotatable bag holder having a plurality of spaced radial bag supporting members thereon for simultaneously supporting a plurality of bags, each of said members including a series of spaced elongated fingers slidably mounted for

lateral movement thereon from spaced apart to collapsed positions, means associated with said supporting members for moving said fingers relative to each other, puckering pins supported on said holder on opposing sides of and between said fingers and movable in opposing directions therebetween and therewith for puckering the bag, stringing needles and needle operating mechanism for entering the needles through the puckered portion of said bag, means for threading said needles with string, means for knotting the ends of said string, and means for removing the strung bag from said bag holder, all of said means being synchronized and operable in timed relation with each other during the operation of the machine

5. A machine for stringing bags comprising a rotatable bag holder having a plurality of spaced radial bag supporting members thereon for simultaneously supporting a plurality of bags, each of said members including a series of spaced elongated fingers mounted for lateral movement thereon from spaced apart to collapsed positions, means associated with said supporting members for moving said fingers relative to each other, pairs of puckering pins supported on said holder on opposing sides of and between said fingers and movable in opposing directions therebetween and therewith for puckering the bag, stringing needles and needle operating mechanism for entering the needles through the puckered portion of said bag, means for threading said needles with string, means for knotting the ends of said string, and means for removing the strung bag from said bag holder, all of said means being synchronized and operable in timed relation with each other during the operation of the machine.

6. A machine for stringing bags comprising a rotatable bag holder having a plurality of spaced radial bag supporting members thereon for simultaneously supporting a plurality of bags, each of said members including a series of spaced fingers mounted for lateral movement thereon from spaced apart to collapsed positions, puckering pins mounted on said holder between said fingers and movable therebetween and therewith for puckering the bag, cam means on said holder and means connecting said fingers and pins with said cam means for respectively moving said fingers and pins, stringing needles and needle operating mechanism for entering the needles through the puckered portion of said bag, means for threading said needles with string, means for knotting the ends of said string, and means for removing the strung bag from said bag holder, all of said means being synchronized and operable in timed relation with each other.

7. A machine for stringing bags comprising a rotatable bag holder having a plurality of spaced radial bag supporting members thereon for simultaneously supporting a plurality of bags, each of said members including a series of spaced fingers mounted for lateral movement thereon from spaced apart to collapsed positions, puckering pins mounted on said holder on opposing sides of and between said fingers and movable in opposing directions therebetween and therewith for puckering the bag, cam means on said holder and interconnected means connecting said fingers and pins with said cam means for respectively moving said fingers and pins, stringing needles and needle operating mechanism for entering the needles through the puckered portion of said bag, means for threading said needles with string, means for knotting the ends of said string, and means for removing the strung bag from said holder, all of said means being synchronized and operable in timed relation with each other.

8. A machine for stringing bags comprising a rotatable bag holder having movable bag supporting members thereon for positioning bags for stringing, each of said members including a series of spaced fingers mounted for lateral movement from spaced apart to collapsed positions, means associated with said supporting members for moving said fingers relative to each other, puckering means associated with said movable bag supporting members, means for respectively and simultaneously moving said members and puckering means for puckering the bag, stringing needles and needle operating mechanism for entering the needles through the puckered portion of said bag, tubular means for threading said needles with string, spring pressed means associated with said tubular means for tensioning said string, means for knotting the ends of said string, and means for removing the strung bag from said bag holder, all of said means being synchronized and operable in timed relation with each other during the operation of the machine.

9. A machine for stringing bags comprising a rotatable bag holder having movable bag supporting members thereon for positioning bags for stringing, each of said members including a series of spaced fingers mounted for lateral movement from spaced apart to collapsed positions, means associated with said supporting members for moving said fingers relative to each other, puckering means associated with said movable bag supporting members, means for respectively and simultaneously moving said members and puckering means for puckering the bag, stringing needles and needle operating mechanism for entering the needles through the puckered portion of said bag, tubular means for threading said needles with string, spring pressed means associated with said tubular means for tensioning said string, means for knotting the ends of said string, guiding means for said string associated with said threading means for preventing said string from kinking, and means for removing the strung bag from said bag holder, all of said means being synchronized and operable in timed relation with each other during the operation of the machine.

10. A machine for stringing bags comprising a rotatable bag holder having movable bag supporting members thereon for positioning bags for stringing, each of said members including a series of spaced fingers mounted for lateral movement from spaced apart to collapsed positions, means associated with said supporting members for moving said fingers relative to each other, puckering means associated with said movable bag supporting members, means for respectively and simultaneously moving said members and puckering means for puckering the bag, stringing needles and needle operating mechanism for entering the needles through the puckered portion of said bag, arcuate tubular thread feeding means, and means for reciprocating said feeding means for threading said needles with string, spring pressed means associated with said tubular feeding means and engageable with said string for tensioning the latter, guiding means for said string associated with said threading means for preventing said string from kinking, means for knotting the ends of said string, and means for removing the strung bag from said bag holder, all of said means being synchronized and operable in timed relation with each other during the operation of the machine.

11. A machine for stringing bags comprising a rotatable bag holder having a plurality of spaced radial bag supporting members thereon for simultaneously supporting a plurality of bags, each of said members including a series of spaced fingers mounted for lateral movement thereon from spaced apart to collapsed positions, puckering pins mounted on said holder on opposing sides of and between said fingers and movable in opposing directions therebetween and therewith for puckering the bag, cam means on said holder and links pivotally connected to each other and said fingers and pins, and means for connecting said links with said cam means for respectively and simultaneously moving said links and said fingers and pins, and stringing needles and needle operating mechanism for entering the needles through the puckered portion of said bag, means for threading said needles with string, means for knotting the ends of said string, and means for removing the strung bag from said

holder, all of said means being synchronized and operable in timed relation with each other.

12. A machine for stringing bags comprising a rotatable bag holder having a plurality of spaced radial bag supporting members thereon for simultaneously supporting a plurality of bags, each of said members including a series of spaced fingers mounted for lateral movement thereon from spaced apart to collapsed positions, puckering pins mounted on said holder on opposing sides of and between said fingers and movable in opposing directions therebetween and therewith for puckering the bag, cam means on said holder for rotation therewith, and links pivotally connected to each other and to the lower portions of said fingers and pins, and means for connecting said links with said cam means for actuating the links and respectively and simultaneously moving said fingers and pins, and stringing needles and needle operating mechanism for entering the needles through the puckered portion of said bag, means for threading said needles with string, means for knotting the ends of said string, and means for removing the strung bag from said holder, all of said means being synchronized and operable in timed relation with each other.

13. A machine for stringing bags comprising a rotatable bag holder having a plurality of spaced radial bag supporting members thereon for simultaneously supporting a plurality of bags, each of said member including a series of spaced fingers mounted for lateral movement thereon from spaced apart to collapsed positions, puckering pins mounted on said holder on opposing sides of and between said fingers and movable in opposing directions therebetween and therewith for puckering the bag, a cam on one side of said holder and rotatable therewith, a cam groove in said cam and means for regulating the curvature of said groove, series of links pivotally connected to each other and to the lower portions of said fingers and pins, shafts on said holder extending through said bag supporting members, means for connecting said shafts with said cam groove for actuating said links and respectively and simultaneously moving said fingers and pins, and stringing needles and needle operating mechanism for entering the needles through the puckered portion of said bag, means for knotting the ends of said string, and means for removing the strung bag from said holder, all of said means being synchronized and operable in timed relation with each other.

14. A machine for stringing bags comprising a rotatable bag holder having a series of rods, a plurality of spaced radial bag supporting members movably sleeved on and supported by said rods, each of said members including a series of spaced elongated removable fingers mounted for lateral movement on said rods, a series of links pivotally connected to each other and to the lower portions of said fingers, and a second series of links pivotally connected to each other and to said first series of links, puckering pins carried by one series of links and extending on opposing sides of and between said fingers and movable in opposing directions with said links between said fingers and therewith for puckering the bag, a series of shafts extending through said bag supporting members, a cam on said holder having a cam groove therein, rollers on said shafts positioned in said cam groove whereby rotation of said holder and cam actuates said shafts and said series of links for simultaneously moving said fingers and pins and stringing needles and needle operating mechanism for entering the needles through the puckered portion of the said bag, means for knotting the ends of said string, all of said means being synchronized and operable in timed relation with each other.

15. A machine for stringing bags comprising a rotatable bag holder having a series of rods, a plurality of spaced radial bag supporting members movably sleeved on and supported by said rods, each of said members including a series of spaced elongated removable fingers mounted for lateral movement on said rods, a series of links pivotally connected to each other and to the lower portions of said fingers, and a second series of links pivotally connected to each other and to said first series of links, puckering pins carried by one series of links and extending on opposing sides of and between said fingers and movable in opposing directions with said links between said fingers and therewith for puckering the bag, a series of shafts extending through said bag supporting members, a cam on said holder having a cam groove therein, rollers on said shafts positioned in said cam groove whereby rotation of said holder and cam actuates said shafts and said series of links for simultaneously moving said fingers and pins, means removably positioned in said cam groove for varying the width thereof and controlling the movement of said shafts, and stringing needles and needle operating mechanism for entering the needles through the puckered portion of said bag, means for knotting the ends of said string, all of said means being synchronized and operable in timed relation with each other.

16. A machine for stringing bags comprising a rotatable bag holder having a series of rods, a plurality of spaced radial bag supporting members movably sleeved on and supported by said rods, each of said members including a series of spaced elongated removable fingers mounted for lateral movement on said rods, a series of links pivotally connected to each other and to the lower portions of said fingers, and a second series of links pivotally connected to each other and to said first series of links, puckering pins carried by one series of links and extending on opposing sides of and between said fingers and movable in opposing directions with said links between said fingers and therewith for puckering the bag, a series of shafts extending through said bag supporting members, a cam on said holder having a cam groove therein, rollers on said shafts positioned in said cam groove whereby rotation of said holder and cam actuates said shafts and said series of links for simultaneously moving said fingers and pins, cam plates positioned in and removably connected to the side of said cam groove for varying the width thereof and controlling the movement of said shafts, and stringing needles and needle operating mechanism for entering the needles through the puckered portion of said bag, means for knotting the ends of said string, all of said means being synchronized and operable in timed relation with each other.

17. A machine for stringing bags comprising a rotatable bag holder having a series of rods, a plurality of spaced radial bag supporting members movably sleeved on and supported by said rods, each of said members including a series of spaced elongated removable fingers mounted for lateral movement on said rods, a series of links pivotally connected to each other and to the lower portions of said fingers, and a second series of links pivotally connected to each other and to said first series of links, puckering pins carried by one series of links and extending on opposing sides of and between said fingers and movable in opposing directions with said links between said fingers and therewith for puckering the bag, a series of shafts extending through said bag supporting members, a cam on said holder having a cam groove in the annulus thereof, rollers on said shafts positioned on said cam groove whereby rotation of said holder and cam actuates said shafts and said series of links for simultaneously moving said fingers and pins, arcuate cam plates positioned in and removably connected to one side of said cam groove for varying the width thereof and controlling the movement of said shafts, and stringing needles and needle operating mechanism for entering the needles through the puckered portion of said bag, means for knotting the ends of said string, all of said means being synchronized and operable in timed relation with each other.

18. A machine for stringing bags comprising a rotatable bag holder having movable bag supporting members for

positioning bags for stringing, each of said members including a series of spaced fingers mounted for lateral movement from spaced apart to collapsed positions, means associated with said supporting members for moving said fingers relative to each other, puckering means associated with said movable bag supporting members, means for respectively and simultaneously moving said members and puckering means for puckering the bag, stringing needles and needle operating mechanism for entering the needles through the puckered portion of said bag, tubular means for threading said needles with string, spring pressed means associated with said tubular threading means and engageable with said string for tensioning the latter, cylindrical guiding means adjacent to and associated with said threading means for frictionally engaging with and straightening said string whereby the latter will be uniformly fed into the needles, and means for removing the strung bag from said bag holder, all of said means being synchronized and operable in timed relation with each other during the operation of the machine.

19. A machine for stringing bags comprising a rotatable bag holder having movable bag supporting members for positioning bags for stringing, means associated with said supporting members for moving said fingers relative to each other, puckering means associated with said movable bag supporting members, means for respectively and simultaneously moving said members and puckering means

for puckering the bag, stringing needles and needle operating mechanism for entering the needles through the puckered portion of said bag, arcuate tubular means for threading said needles with string, spring pressed means interengageable with said tubular threading means and engageable with said string for tensioning the latter, a string supply spool for feeding thread to said tubular means, means associated with said spool for preventing the string from becoming entangled thereon, and tapered tubular guiding means arranged between said spool and said tubular threading means for straightening said string whereby the latter will be uniformly fed into the needles, and means for removing the string bag from said bag holder, all of said means being synchronized and operable in timed relation with each other during the operation of the machine.

References Cited in the file of this patent

UNITED STATES PATENTS

862,057	Dalton	July 30, 1907
1,019,186	Roberts	Mar. 5, 1912
1,036,973	Dalton	Aug. 27, 1912
1,039,241	Allen	Sept. 24, 1912
1,134,034	Corcoran	Mar. 30, 1915
1,342,669	Embree	June 8, 1920
2,511,658	West	June 13, 1950
2,647,478	Eastman	Aug. 4, 1953