June 17, 1952 H. A. COLLINS ET AL 2,600,971

TAMPON APPLICATOR GRIP FORMING APPARATUS

Filed July 1, 1948

5 Sheets-Sheet 1

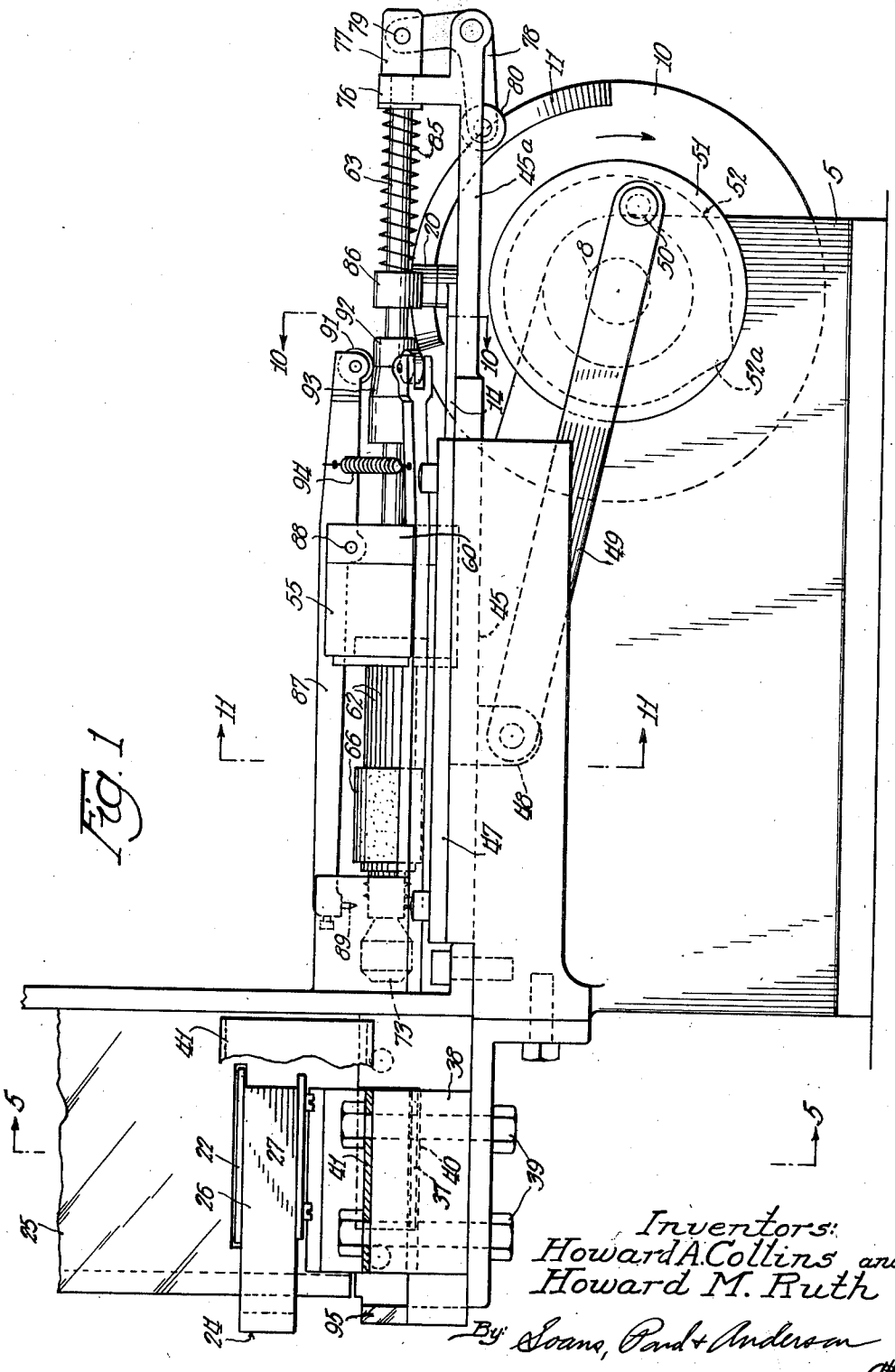

Fig. 1

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5 Sheets-Sheet 2

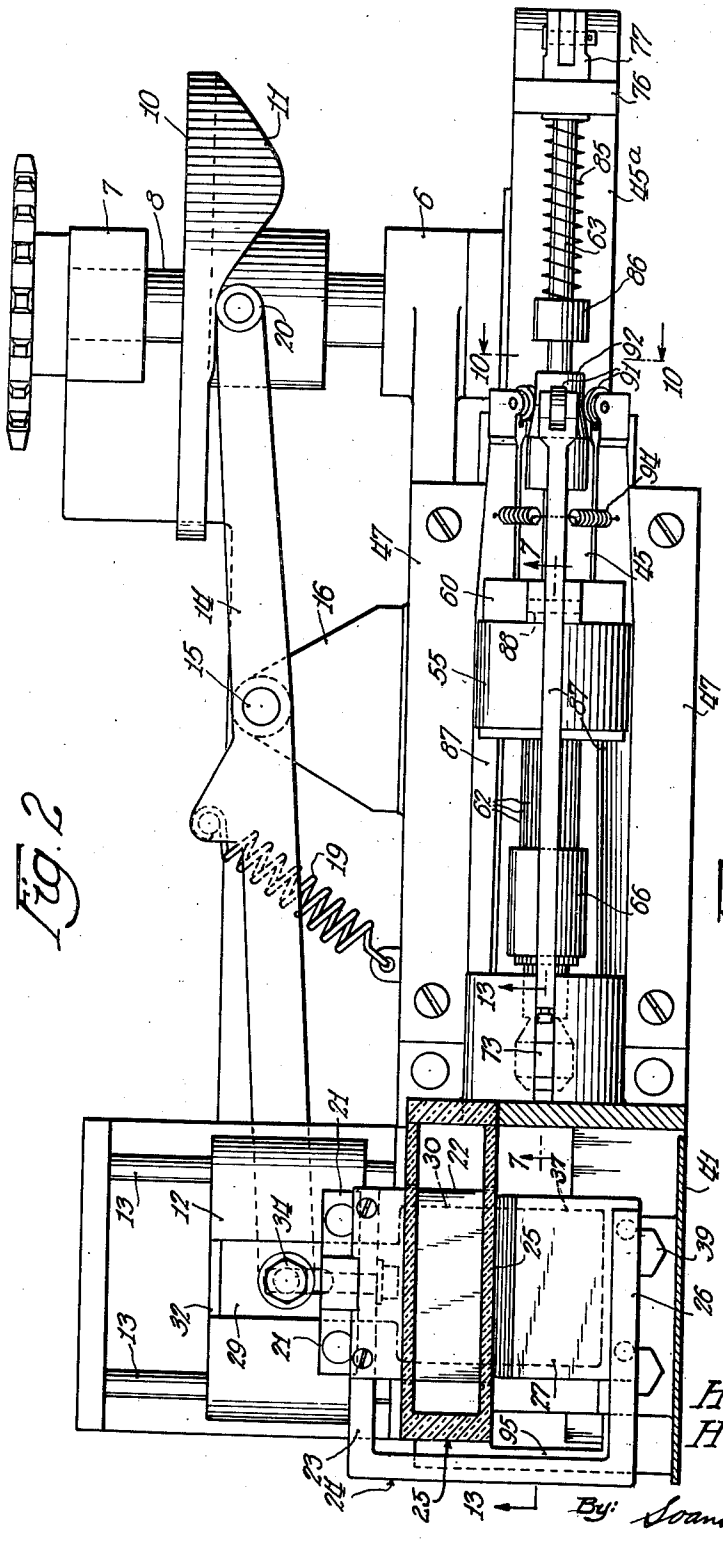

Fig. 2

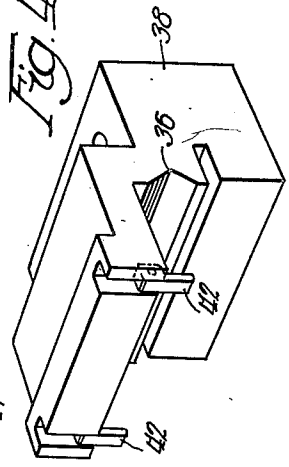

Fig. 1

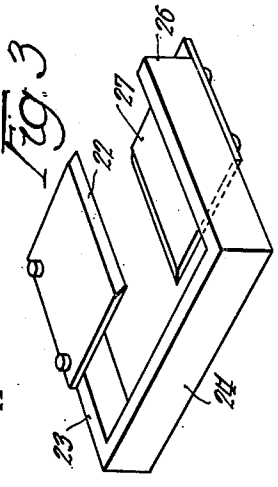

Fig. 3

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5 Sheets-Sheet 3

Fig. 6

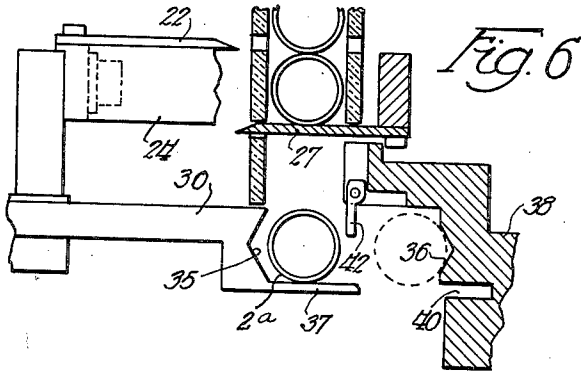
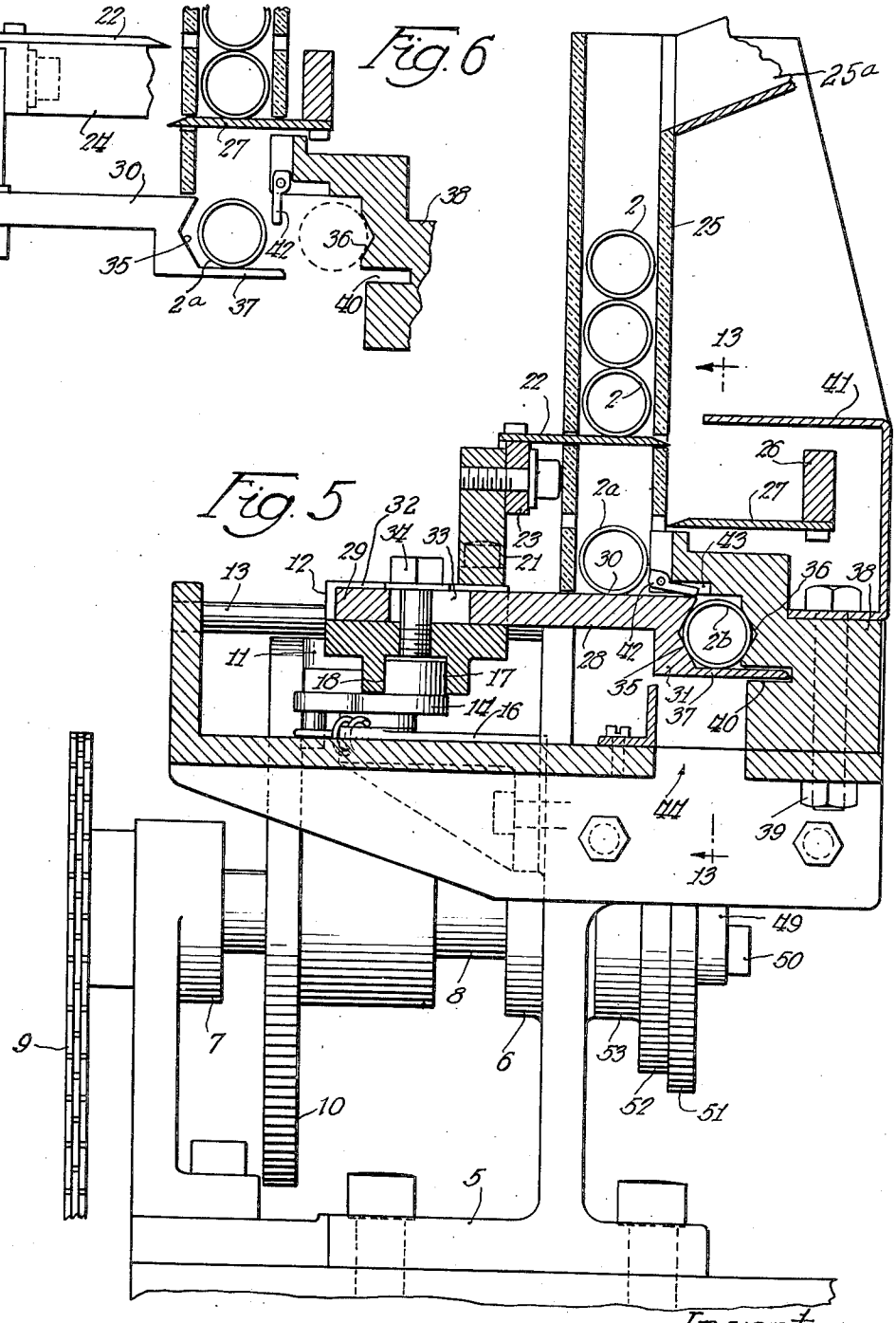


Fig. 5



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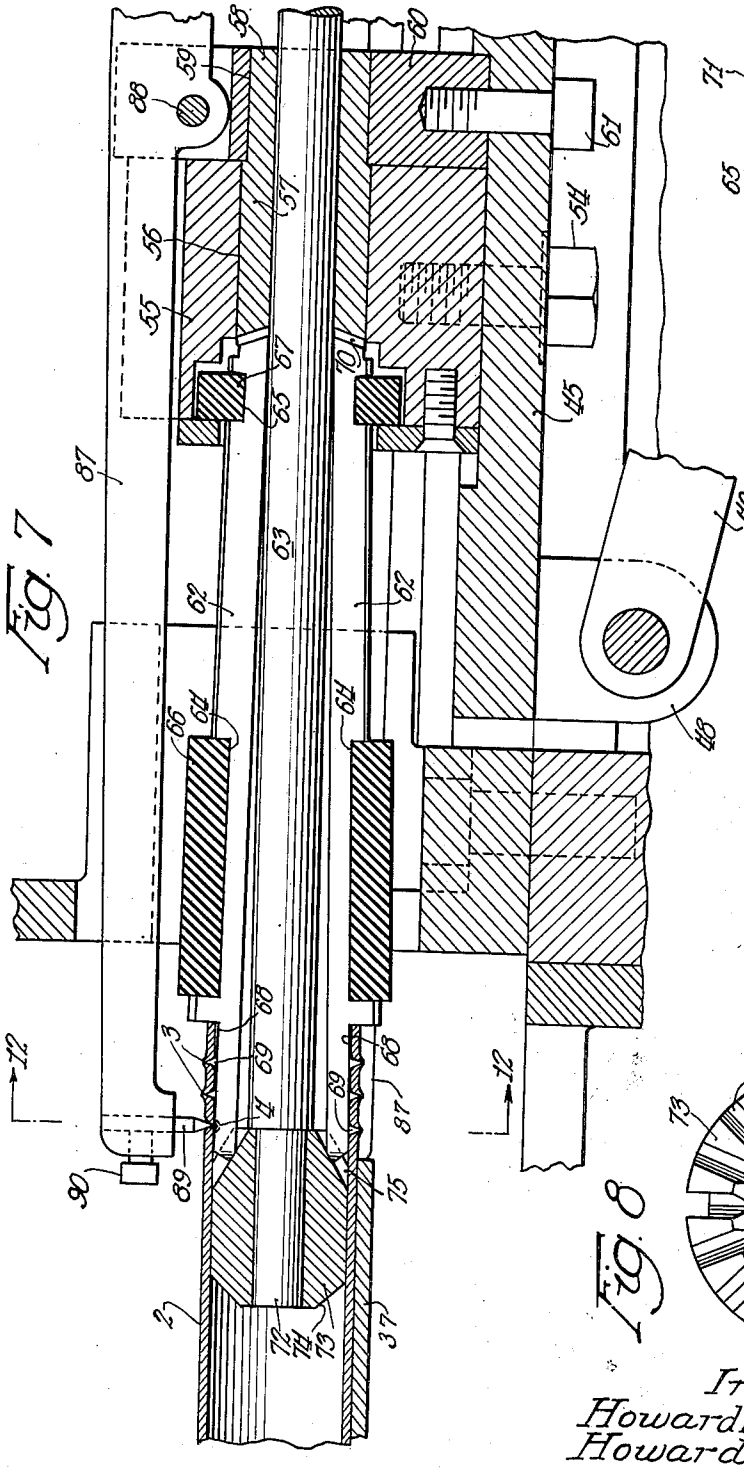

Fig. 7

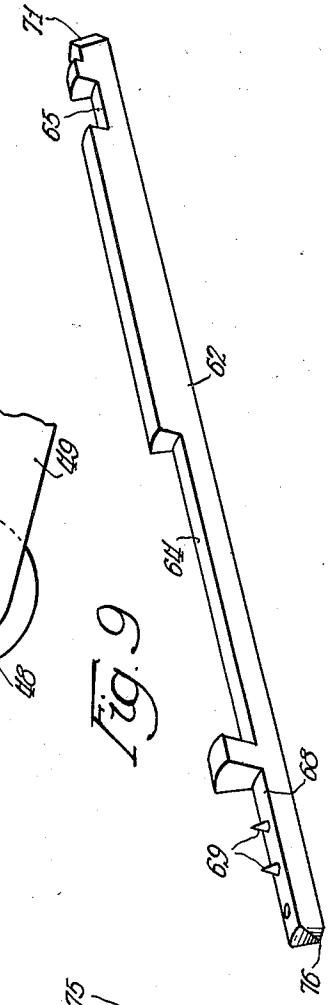

Fig. 9

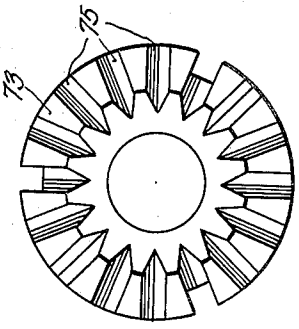

Fig. 8

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5 Sheets-Sheet 5

Fig. 10

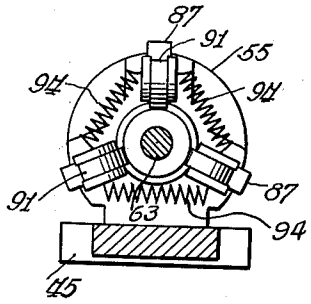


Fig. 11

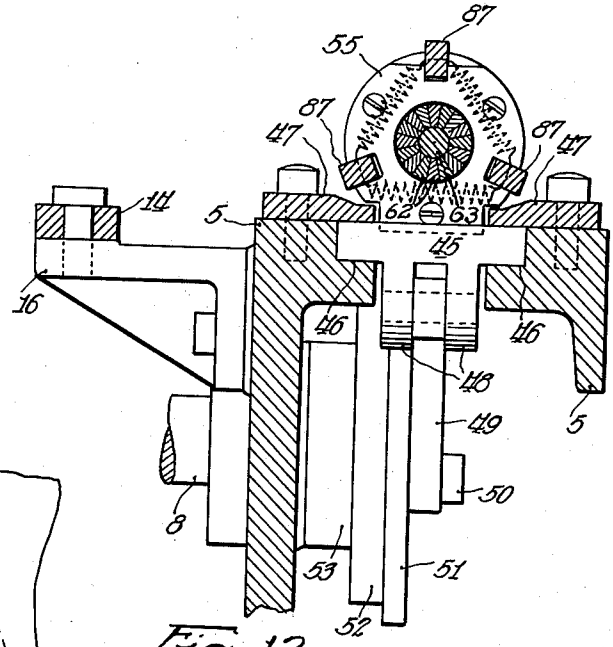


Fig. 12

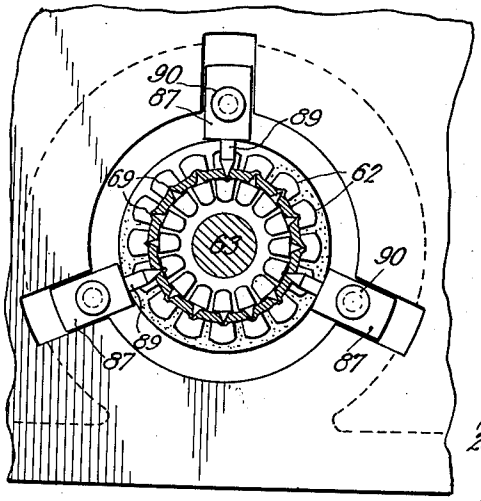


Fig. 13

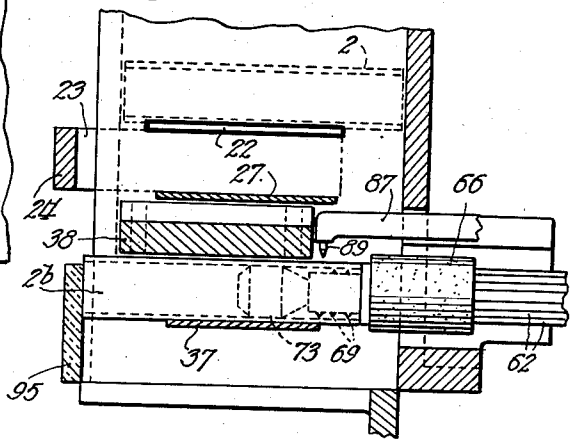
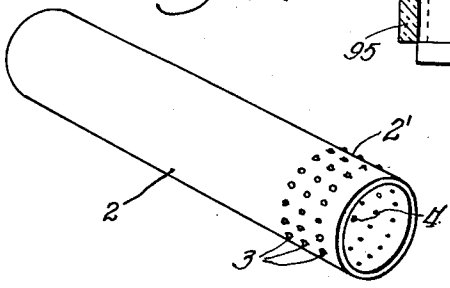


Fig. 14



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Patented June 17, 1952

2,600,971

UNITED STATES PATENT OFFICE

2,600,971

TAMPON APPLICATOR GRIP FORMING APPARATUS

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Application July 1, 1948, Serial No. 36,528

5 Claims. (Cl. 164—90)

1

This invention relates to an improvement in mechanism or apparatus for forming a grip on a tampon applicator tube to facilitate holding of the tube during application of the tampon.

The improved apparatus is especially desirable although not exclusively so, in connection with double tube tampon applicators wherein a tampon is seated in one end portion of an applicator tube and an ejector tube is seated in the other end portion and of such length that it projects beyond the adjacent end of the applicator tube. Such tampon applicator is usually manipulated by gripping an end portion of the applicator or outer tube between two fingers and pressing the ejector tube inwardly with another finger of the same hand. This operation is greatly facilitated if provision is made to prevent slipping of the outer tube from between the fingers and it is for the production of such a gripping surface that the present apparatus is designed.

The main objects of the invention are to provide apparatus of an automatic character, which will successively separate applicator tubes from a batch thereof, apply the desired gripping surface to the tubes one by one and automatically discharge the tubes with their gripping areas to whatever type of receiver is preferred.

Another object is to provide grip forming means which will operate automatically at very high speed and which will produce the desired gripping area without removing material from the applicator tube, thereby to avoid the necessity for handling removed material while also preserving a high degree of cleanliness in the premises in which the apparatus is employed.

A further object of the invention is to simultaneously with the production of the above described finger gripping area, to provide means whereby the outer tube will effectively frictionally grip the inner or ejector tube so as to be capable of preserving the required assembled relationship between the outer and inner tubes. It is also an object of the invention to provide apparatus for performing the operations indicated, which apparatus is of a simple and easy to build, maintain and operate character, and other objects and advantages of the invention will be understood by referring to the following specification and accompanying drawings (5 sheets) in which there is illustrated a machine embodying a selected form of the invention.

In the drawings,

Fig. 1 is a side elevation of the selected machine;

2

Fig. 2 is a plan;

Figs. 3 and 4 are perspectives respectively of certain elements of the mechanism;

Fig. 5 is a section on the plane represented approximately by the line 5—5 of Fig. 1;

Fig. 6 is a section corresponding to a portion of Fig. 5 but showing a changed position;

Fig. 7 is a section on the plane represented approximately by the line 7—7 of Fig. 2;

Fig. 8 is an end elevation of a detail;

Fig. 9 is a perspective of another detail;

Fig. 10 is a cross section on the plane represented by the line 10—10 on Figs. 1 and 2;

Fig. 11 is a cross section on a plane represented by the line 11—11 of Fig. 1;

Fig. 12 is a cross section on the plane represented by the line 12—12 of Fig. 7;

Fig. 13 is a cross section on the plane represented by the line 13—13 of Figs. 2 and 5;

Fig. 14 is a perspective illustrating a tampon applicator tube having a grip formed thereon by the apparatus shown in the other figures.

The mechanism herein shown operates on paper board tubes 2 (see Fig. 14) which are to be prepared for use as parts of tampon applicators. The tubes are of substantially cylindrical form and of substantially uniform pre-cut length. The apparatus functions to produce on an end portion 2' of each tube, a series of outwardly projecting, sharp-pointed or sharp-edged nodes or spurs 3 which afford a non-slipping finger grip on the tube. In addition a number of inwardly projected nodes or spurs may also be formed as represented at 4 in Fig. 14. The inwardly projecting parts 4 are desirable for providing a friction grip on another tube which is slidable within the tube 2 for ejecting a tampon or other member from said tube 2.

The apparatus comprises a base 5 of suitable construction, said base being so formed as to provide spaced bearing bosses 6 and 7 either in integral parts of the base or in brackets secured to the base. In this instance, the bearing parts 7 are shown formed in a bracket which is bolted to the base and the bearing 6 is an upstanding portion integral with the base 5.

The bearing bosses 6 and 7 rotatably support a shaft 8 which is continuously driven by a chain drive 9 or in any other suitable manner. Between the bearings 6 and 7, the shaft 8 has mounted on it a cam disc 10 having on it a laterally projected face cam portion 11 which extends around a little more than one-quarter of the circumference of the disc, as shown in Fig. 1. This cam 11 actuates mechanism for

controlling the feed of the tubes 2 from the hopper and for positioning the tubes for the operation of instrumentalities which produce the spurs or nodes 3 and 4.

The tube feeding and positioning elements are carried by a slide block 12 which is horizontally reciprocably slidably mounted on a pair of guide rods 13, 13, the latter being supported at their ends in upstanding frame portions provided for that purpose as best shown in Figs. 2 and 5. The block 12 is reciprocated on said guide rods 13 by means of a lever 14 which is pivoted intermediate its ends as indicated at 15, on an ear or a bracket 16 which extends from a part of the base 5. One end of said lever 14 is provided with an upwardly projecting roller 17 which fits in a slot 18 provided on the under side of the slide block 12. Said slot 18 extends crosswise of the direction of movement of the slide block 12 so as to permit relative shifting of the roller 17 transversely of the direction of movement of the slide as required by the arcuate path of travel of the roller 17 about the axis of the pivot 15.

A spring 19 stretched between a portion of the lever 14 and an anchor on the frame or base 5 serves to normally urge the lever to rock in one direction. The other end of the lever 14 is equipped with a roller 20 which engages the cam 11 so that said cam is operative to periodically rock the lever against the tension of the spring 19 to thereby retract the slide block 12 from the position in which it is normally held by said spring 19.

The slide block 12 has mounted on it an upstanding block 21 which carries a knife-like plate member 22. Said plate member 22 is secured to said block 21 through the agency of an arm 23 of a U-shaped mounting member 24 (see Figs. 2, 3 and 5) which straddles a chute or guide-way 25 in which the tubes 2 move downwardly from a hopper 25*a* which may contain a batch of tubes or receive them one by one from tube forming or treating apparatus. The arm 23 of the said U-shaped member is bolted as shown in Fig. 5 to the mounting block 21 and said separator plate 22 is screwed or otherwise secured to the upper edge of said arm 23. The other side arm 26 of said U-shaped member carries a second knife-like separator plate 27 which is secured to the bottom edge of said arm 26 by screws or otherwise.

The chute or guide-way 25 is of generally rectangular form in cross section as will be seen from an inspection of Figs. 2 and 5, the chute being of an internal size which substantially corresponds to the length and diameter of the tubes 2. Preferably the size of the chute is such that the tubes will fall freely by gravity through said chute.

In the normal position of the slide block 12, the separator 22 is held in its inwardly disposed position as shown in Fig. 5 wherein it supports the overlying stack of tubes 2. When the plate 22 is in its in position as shown in Fig. 5, the second separator plate 27 is in its out position as also shown in Fig. 5. The broad face walls of the chute 25 are suitably apertured or slotted as indicated, to permit the passage of the plates 22 and 27 transversely through the chute as indicated, said plates being of somewhat less width than the horizontal length of the chute.

When the cam 11 rocks the lever 14 to retract the slide block 12, the upper separator 22 will, of course, be withdrawn from the chute and the lower plate 27 will be moved into the chute so as to catch the stack of tubes 2 as they drop past the withdrawing plate 22. It will be apparent from an inspection of Fig. 5 that the tubes cannot drop past the plate 22 until said plate is almost completely withdrawn from the chute and that at that time, the lower plate 27 will extend across almost the entire width of the chute so as to again trap the tubes. When the cam 11 permits the spring 19 to return the slide to its normal position as shown in full lines in Fig. 5, the plate 22 will enter between the tube supported on the plate 27 and the next overlying tube so that all of the tubes in the chute except the lowermost tube are again supported by the plate. The lowermost tube will, of course, be permitted to drop further down in the chute when the lower plate 27 is again completely withdrawn from the chute.

In addition to the separator plates 22 and 27, the slide 12 carries a tube positioning and clamping device 28. Said positioning and clamping device comprises a stem or shank part 29, an intermediate widened part 30, and a head part 31. The shank part 29 fits in a slot or recess 32 in the top of the slide 12 and it is provided with a slot 33 through which a clamping bolt 34 passes into threaded engagement with the underlying portion of the slide. The shank part 29 is sufficiently elongated to permit the member 28 to be adjusted relative to the slide as permitted by the slot 33, the bolt 34 being adapted to clamp the member 28 in any selected position of adjustment.

The intermediate portion 30 of the member 28 is widened as best indicated in Fig. 2 to a width approaching the width of the separator plates 22 and 27 so that said intermediate portion 30 is also capable of supporting a tube in said chute as represented at 2*a* in Fig. 5.

The head 31 of said member 28 has its front end provided with a V-shaped arched seat 35 for cooperating with an opposed V-shaped or arched seat 36 to grip a tube 2*b* in a predetermined position in which the spurs or nodes 3 and 4 are formed in the tube. Said head 31 is also provided with a lower shelf-like extension 37 which is operative to receive the tube 2*a* when the member 28 is retracted with the slide 12 to the position illustrated in Fig. 6. As there shown, the tube 2*a* will have dropped from the top face of the intermediate part 30 of the member 28 to said shelf 37 so as to be ready for lateral advancement into engagement with the seat 36.

The seat 36 against which the tube is held by the head 31 is formed in a block 38 which is bolted to the base structure by a pair of bolts 39 (Figs. 1 and 5). Said block is also provided with a slot or recess 40 which receives the shelf or tongue part 37 of the movable head when the latter is in its most advanced position as illustrated in Fig. 5. A suitable cover 41 is mounted on a portion of the block 38 and serves to enclose the zone of operation of the arm 26 and separator plate 27.

To prevent the tube 2*b* from following the presser head 31 back to tube receiving position, a pair of pawls or detents 42 (see Figs. 4 and 5) are pivoted for movement in recesses cut in the supporting part of the block 38. Said recesses traverse the vertical face of the upper part of the block and also extend as shown at 43, horizontally in the under face of the block to receive the pawl in approximately horizontal position as shown in Fig. 5. The pawls are, of course,

moved to this horizontal position by the tube positioning head 31 when the latter is advanced to tube holding position, as shown in Fig. 5. When the head is retracted the pawls are permitted to gravitate to their vertical position as shown in Figs. 4 and 6. The movement of the pawls from horizontal to vertical positions follows the retracting movement of the head 31 at such a rate that the ends of the pawls are operative to engage the tube 2b to prevent the latter from following the retracting head whereby when the head is fully retracted to the position shown in Fig. 6, the tube 2b will gravitate downwardly through an opening 44 provided in the base. A suitable receiving conveyor or chute (not shown) is, of course, to be positioned for receiving and conducting the tubes from the apparatus as the tubes are discharged therefrom.

While the tubes are held in the position 2b certain instrumentalities are advanced to operating position relative to an end portion of the tube whereby the outwardly and inwardly projecting spurs are formed. These instrumentalities comprise a plate 45 slidably mounted in ways 46, 46 provided for that purpose in a part of the base 5. Suitable keepers 47, 47 are secured to the base for holding the plate or carriage 45 in place in said ways.

The carriage 45 is provided with a pair of depending ears 48 for pivotally receiving one end portion of a connecting rod or link 49, the other end of which is pivoted on a crank pin 50 carried by a disc 51. Said disc 51 is formed as an integral part of a cam disc 52 which has a hub 53 mounted on said shaft 8.

The rotation of the crank 50 will, of course, be imparted by the link 49 to the carriage 45 which will accordingly reciprocate in the said ways 46, 46.

The carriage 45 has secured to it as indicated at 54, a block 55 which is bored out as shown at 56, to receive a bushing or sleeve 57. Said bushing or sleeve 57 has a reduced diameter end portion 58 which extends into a bore 59 in a separately formed member 60 which is secured by one or more bolts such as 61 to the said carriage 45 immediately adjacent one end of the block 55. The shoulder formed on the sleeve 57 incident to the provision of the aforesaid reduced diameter end portion is seated against a face of the member 60.

A plurality of bars 62, one of which is shown in Fig. 9, are positioned around a rod 63 which is slidably seated in the bore of the bushing 57. Said bars are more or less wedge shaped in a transverse section as shown in Fig. 11, so that when assembled in side to side relation they form a substantially complete cylinder about said rod 63. The bars 62 are provided with recesses 64 and 65 which form annular recesses in the assembled bars and rubber or other suitable elastic material collars 66 and 67 are respectively seated in said recesses 64 and 65. Said elastic collars are of such normal diameter that they yieldingly hold the bars 64 in closed position about the rod 63 as illustrated in Fig. 11.

The front or outer ends of said bars 62 are recessed as indicated at 68, and the recessed faces of these end portions are provided with pricking pins, such as represented at 69 in Figs. 7 and 9. The bars 62 are adapted to be expanded from closed position about the rod 63 so as to cause the pricking pins 69 to outwardly prick the tube end portions to form the outwardly projecting nodes or spurs 3 as best shown in Fig. 7.

To maintain the bars 62 against circumferential movement about the rod 63 and to provide bearing surfaces for pivotal movement by which the bars are expanded, the front end of the sleeve 58 is provided with a series of radially extending V-shaped notches 70 and the adjacent ends of the bars are provided with V-shaped ends as indicated at 71 (Fig. 9).

It will be seen that as an incident to reciprocating movement of the carrier plate 45 with its attached members 55 and 60, the sleeve 57 and the bars 62 will be correspondingly moved. The carrier plate 45, its members 55 and 60 and the bars 62 and parts associated therewith are shown in retracted position in Figs. 1 and 2 but in advanced position in Fig. 7, the latter showing the parts as they appear when the tube pricking operation is being performed. At its front end, the rod 63 is provided with a reduced diameter extension 72 on which there is seated a guide member 73, the front end of which is bevelled as shown at 74 to facilitate entrance of the member into the adjacent end of a tube 2 held in the position 2b of Fig. 5. The opposite end of the guide 73 is provided with a series of V-shaped recesses or seats 75 in a bevelled face of the member 73. The free ends of the bars 62 are provided with suitably pointed ends 76 to conform to the V-shaped grooves 75 and ride therein as an incident to relative longitudinal movement between said bars 62 and the rod 63 with its attached guide member 73. It will be seen that incident to such relative movement the free ends of the bars 62 will ride outwardly in the diverging seats 75 to thereby effect expansion of the adjacent end portions of the bars 62 to effect the tube pricking as shown in Fig. 7. The rubber collars 66 and 67 are of course stretched incident to such expanding movement of the bars 62 and serve to effect return movement of the bars when the latter are moved longitudinally away from the member 74 upon return of the parts from the position shown in Fig. 7 to the starting position shown in Figs. 1 and 2.

The rod 63 extends through the sleeve 58 and has its outer end slidably mounted in an upstanding ear 76 formed on an extension portion 45a of the slide 45. The slidably mounted end of the rod 63 is equipped with a clevis 77. A bell crank 78 has the free end of one arm pivoted as indicated at 79 to said clevis and the free end of its other arm provided with a roller 80 which is adapted to be engaged by the hump 52a on the cam 52. In Fig. 1 the parts are shown in their starting or retracted position so that the roller 80 appears spaced from the path of travel of the cam hump 52a but it will be understood that when the parts are advanced to the position shown in Fig. 7, said roller 80 will be disposed in operative relation to the cam so that said cam hump 52a will act to rock the bell crank 78 in a clockwise direction as shown in Fig. 1, whereby the rod 63 will be moved rearwardly, thereby causing the guide element 74 on the other end of the rod to enter between the adjacent ends of the bars 62 to effect expansion thereof as shown in Fig. 7. This rearward movement of the rod 63 and guide 74 occurs during a time interval in which the slide 45 and the parts carried thereby, including said pricking bars 62, are substantially at rest. This occurs when the crank pin 50 is disposed in approximately diametrically opposed relation to the position in which it is shown in Fig. 1 and the crank pin is moving mainly transversely of the direction of

sliding movement imparted to the plate **55**. The cam hump **52***a* is relatively narrow in the direction of its travel so that the rod **63** and expander or guide **74** is held in the expanding position shown in Fig. 7 only momentarily and is almost immediately retracted by contraction of the rubber sleeves **66** and **67**. Whatever slight reciprocating movement may be imparted to the slide **45** and to the pricking bars **62** by the continuous movement of the crank pin is insignificant in respect of any bearing on the pricking action of the prick point **69**. In any event, the tubing **2** being of relatively soft and easily deformable material may yield slightly if necessary to permit any slight endwise movement of the rod **63** and pricking bars **62**. The conical shape of the pricking points **69** serves also to permit slight lateral movement of the points during inward movement or retraction thereof without significantly distorting the material of the tubes **2**.

A spring **85** disposed around the rod **63** and under compression between the ear **76** and a collar **86** secured to said rod serves to restore the rod and its expander head **73** to its normal position relative to the pricking bars **62** as soon as permitted to do so by the movement of the cam hump **52** past the roller **80**. Engagement of the clevis **77** with the ear **76** determines the limit of movement of the rod **63** under the expansive force of the spring **85**.

In the apparatus herein shown there are provided sixteen pricking bars **62** so that a corresponding number of rows of outwardly projecting spurs **3** are formed, most of the bars **62** being provided with three prick points in a row. This number of pricking bars and pricking points may, of course, be varied as desired to provide a greater or smaller number of nodes or spurs **3** on the end portion of the tube **2**.

In the mechanism shown, provision is made for also producing the inwardly projecting nodes or spurs **4** and in this instance three such inward projections are formed, each replacing one of the outwardly projecting spurs **3** so that in the finished product the spurs appear in neatly arranged rows spaced uniformly around the circumference of the tube. While it is not necessary that the inward projections be located in the normal position of an outward projection, this is desirable for appearance purposes.

For producing the inwardly projecting spurs, there are provided in this instance three arms **87**, each pivotally mounted intermediate its ends as indicated at **88** in the slide carried member **60** (see Figs. 2 and 7). The front ends of said arms are each provided with a pricking punch **89** which may be adjustably mounted in the end portion of the arm and located in selected position of adjustment by suitable set screws **90**. The opposite end of each arm **87** is provided with a roller **91** (see Figs. 1 and 2) which bears on a cam sleeve **92** carried by the rod **63**. Said cam sleeve has an intermediate conical portion **93** whereby, when the rod **63** and cam sleeve **92** are moved endwise by the cam **52**, the conical cam sleeve portion will effect spreading of the roller carrying ends of the arms **87** to thereby move the prick carrying ends into tube pricking position as shown in Fig. 7. Springs such as shown at **94**, are stretched between the adjacent arms **87** in such a manner as to resiliently hold the roller carrying ends thereof in operative engagement with the surface of the sleeve cam **92**. Hence, when the rod **63** and sleeve cam are retracted by the spring **85**, the external pricking arms **87** will also be restored to their open position as shown in Figs. 1 and 2.

It will, of course, be observed that the external pricking arms **87** move in unison with the internal pricking arms **62** so that all of said arms are simultaneously brought into operative relation to the tube **2** which is held in operative position as already explained. Similarly the transverse movement of the pricking ends of said arms **62** and **87** is simultaneously effected incident to longitudinal movement of the rod **63** as effected by the cam **52**. While the internal pricking arms **62** are forming the external spurs, the outer arms **87** are also forming the internal spurs in positions which would otherwise normally be occupied by one of the external spurs.

When the pricking arms and the expander head **73** are moved endwise into operative relation to the tube **2**, said tube is held against corresponding endwise movement by engagement with a wall or stop **95** which may conveniently be in the form of a transparent plate element suitably supported from the base **5** of the machine as shown in Fig. 1.

The mechanism is wholly automatic in its operation, requiring no attention from an operator except to see to it that the hopper **25***a* is continuously supplied with tubes to be treated. The operation is quiet and it displaces but does not remove any tube material so that there is no problem of waste handling and disposal.

Various changes in the described structure may be made without departing from the invention.

We claim:

1. In apparatus of the class described, means for holding a tube in predetermined position, a reciprocating carrier, a rod mounted on said carrier for reciprocating movement therewith and so as to be longitudinally movable independently thereof and in the direction of its reciprocating movement, a plurality of punch bars extending lengthwise of said rod and substantially radially therefrom, resilient means normally holding said punch bars in contracted relationship to each other around said rod, outwardly projecting punches carried by end portions of said punch bars, an expander carried by said rod outwardly of the punch carrying ends of said punch bars, the adjacent ends of said punch bars being provided with angularly disposed end portions and said expander having angularly disposed portions for engaging said punch bar end portions for effecting expanding movement of said punch bars relative to each other and relative to said rod as an incident to endwise movement of said rod independently of said carrier, and means for effecting such independent movement of said rod in predetermined timed relationship to the reciprocating movement of said carrier.

2. Apparatus according to claim 1, wherein there is associated with said punch bars an external punch bar which is mounted on said carrier for reciprocating movement therewith and for rocking movement transversely of the length of said rod, and wherein said rod and external punch bar are provided with interengaging means for effecting predetermined rocking movement of said external punch bar at the same time that the other punch bars are expanded.

3. Apparatus of the class described, comprising means for holding a tube in predetermined position, a carrier mounted for sliding movement in the direction of the length of said tube, a rod

mounted on said carrier for unitary movement therewith and also so as to be longitudinally movable independently of said carrier, said carrier being provided with a support in which said rod is slidably mounted for said independent longitudinal movement, a plurality of punch bars disposed around said rod and having punches extending outwardly from the outer surfaces of end portions thereof, said support and said punch bars having interengaging fulcrum means about which said punch bars are rockable, an elastic sleeve surrounding said punch bars adjacent said fulcrum means and recessed into both said support and said punch bars to thereby interconnect the same for said unitary movement, resilient means normally maintaining said punch bars in contracted condition around said rod, an expander carried by said rod and engageable with portions of said punch bars to effect movement of the same outwardly from said rod, means for moving said carrier, rod and punch bars as a unit from an inoperative position into operative position relative to a tube held in said predetermined position and in which operative position the punch carrying portions of said bars are disposed within said tube, and means for actuating said rod and expander thereon independently of said carrier and punch bars to effect said outward movement of the punch bars when the latter are disposed within said tube as aforesaid.

4. Apparatus of the class described, comprising means for holding a tube in predetermined position, a carrier mounted for sliding movement in the direction of the length of said tube, a rod mounted on said carrier for unitary movement therewith and also so as to be longitudinally movable independently of said carrier, said carrier having a sleeve mounted thereon in which said rod is slidably mounted for said independent longitudinal movement, a plurality of punch bars disposed around said rod in radial relation thereto and having punches extending outwardly from the outer surfaces of end portions thereof, said sleeve being provided on one end with a series of radially extending grooves and said punch bars being provided with end portions fitted in said radially extending grooves to thereby position the punch bars around the rod as aforesaid, means interconnecting said punch bars and carrier for simultaneous movement in the direction of movement of the carrier while also permitting said punch bars to be moved laterally, resilient means normally maintaining said punch bars in contracted condition around said rod, an expander carried by said rod and engageable with portions of said punch bars to effect movement of the same outwardly from said rod, means for moving said carrier, rod and punch bars as a unit from an inoperative position into operative position relative to a tube held in said predetermined position and in which operative position the punch carrying portions of said bars are disposed within said tube, and means for actuating said rod and expander thereon independently of said carrier and punch bars to effect said outward movement of the punch bars when the latter are disposed within said tube as aforesaid.

5. Apparatus of the class described, comprising means for holding a tube in predetermined position, a carrier slidable in the direction of the length of said tube, a punch bar carried by said carrier so as to be thereby movable into telescoped relation to said tube, actuating means for effecting lateral movement of said punch bar when the latter is in said telescoped relation to the tube to thereby cause said punch bar to enter said tube so as to press a portion thereof into a projection extending laterally from the wall of said tube, said actuating means and the means for effecting movement of said carrier being such as to also free the punch bar from the tube and withdraw the same from said telescopic relation thereto so as to free the tube for discharge from the apparatus, and a continuously moving crank and a connecting rod connecting said crank to said carrier to effect reciprocation of the latter as an incident to rotation of said crank, said actuating means for effecting lateral movement of said punch bar being timed to actuate said punch bar when said crank is moving mainly transversely of the direction of reciprocation imparted to said carrier.

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