W. B. MORTON.

PAPER BOX MACHINE.

APPLICATION FILED FEB. 28, 1911. RENEWED NOV. 28, 1917.

1,271,604.

Patented July 9, 1918.

2 SHEETS—SHEET 1.

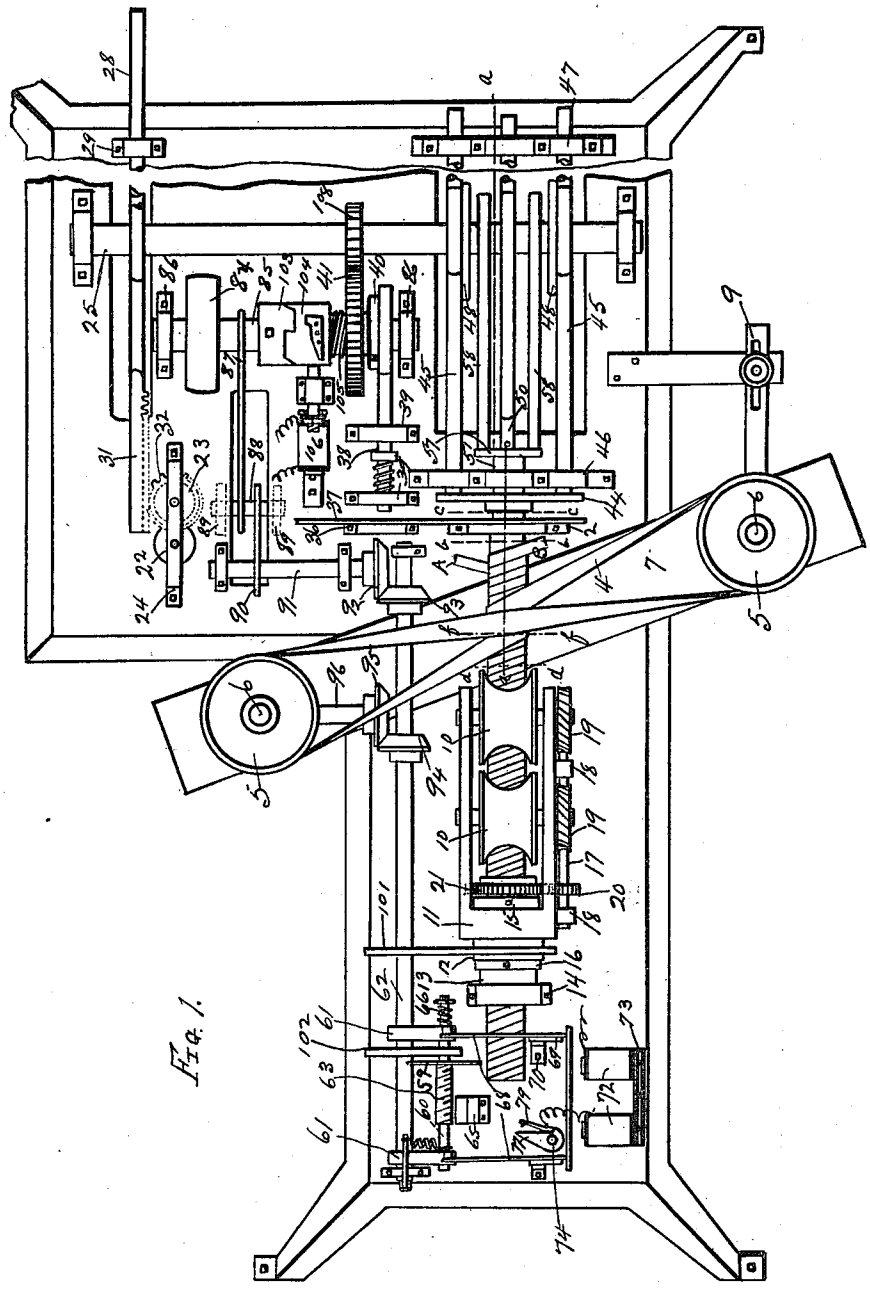


Fig. 1.

Witnesses

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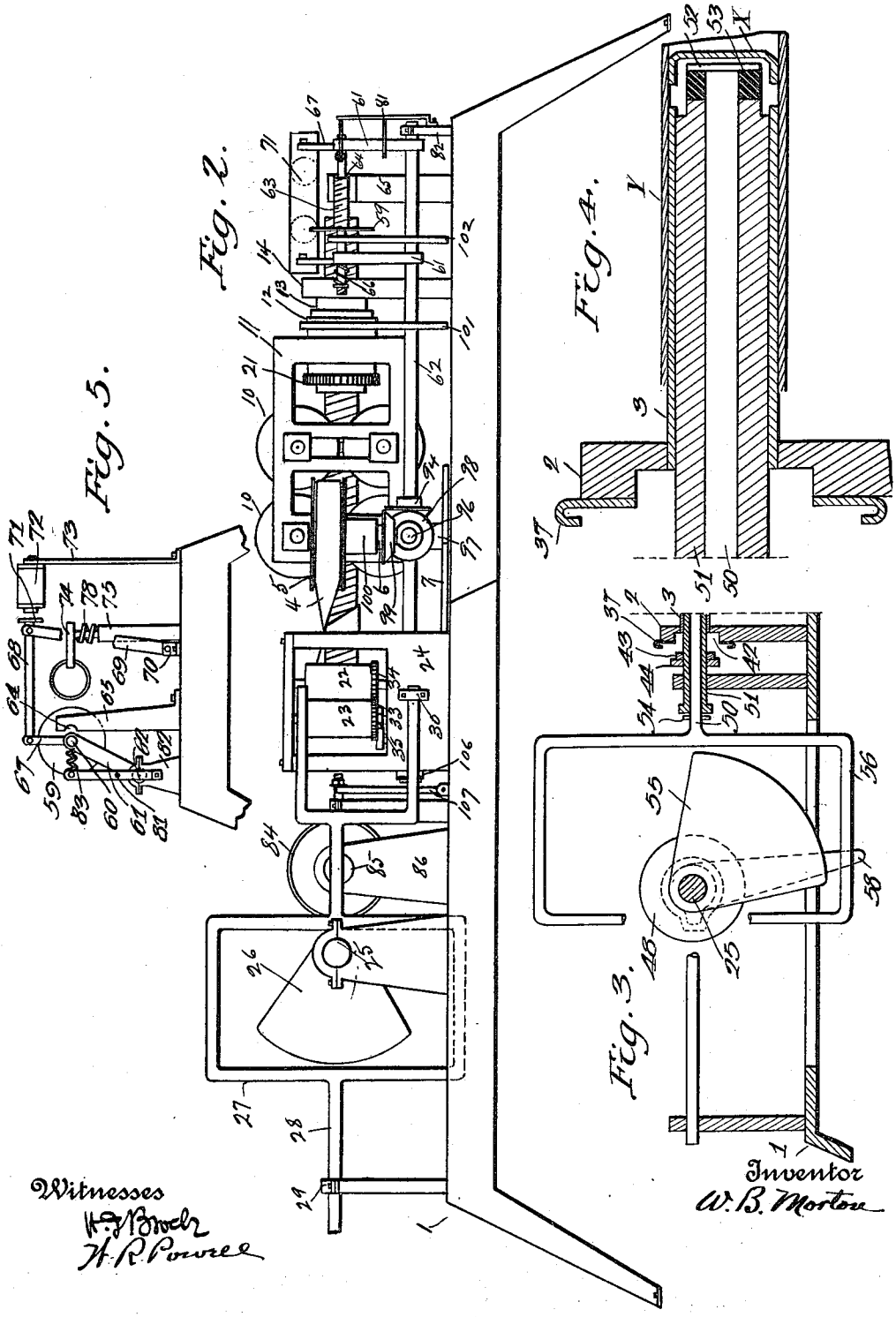
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UNITED STATES PATENT OFFICE.

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PAPER-BOX MACHINE.

1,271,604. Specification of Letters Patent. Patented July 9, 1918.

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To all whom it may concern:

Be it known that I, WOOLRIDGE B. MORTON, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented a new and useful Paper-Box Machine, of which the following is a specification.

This invention relates to the manufacture of paper receptacles, particularly of the type known as paper bottles. These so-called bottles consist of a short section of paper tubing provided at each end with a closure consisting of a flanged paper disk, one of the disks being provided with a small central perforation through which the contents, usually liquid may be poured or forced.

The object of the invention is to provide in an organized machine means for forming the paper tube, inserting the closures therein, and cutting the tube into sections of the desired lengths between the closures.

A further object of the invention resides in the method of forming the receptacle by the above specified sequence of operations.

A practical embodiment of the invention is illustrated in the accompanying drawings and described in the annexed specification, but it is to be understood that the structural details of the mechanism therein disclosed may be varied within wide limits without departing from the spirit of the invention.

The applicant is the first so far as he is aware to provide a single organized machine for forming receptacles of the character described and he is therefore entitled to a liberal construction of his claims.

In the annexed drawings:

Figure 1 is a plan view of the entire machine.

Fig. 2 is a side elevation looking from the top of Fig. 1.

Fig. 3 is a longitudinal section through the closure forming and inserting devices on a portion of the line *a—a*, extending to the cross line *b—b*.

Fig. 4 is a section on the same line on a larger scale extending from line *c—c* to line *d—d*.

Fig. 5 is an end view of the machine on the bottom of Fig. 1 and showing the tube-cutting mechanism.

The tube forming mechanism will first be described. A suitable table is provided for supporting the machine parts. The table is approximately L-shaped and mounted thereon near the center of its long side is a standard 2 supporting the mandrel 3 around which the tube is wound. The mandrel as shown in Fig. 4 consists of thin, hollow tube, preferably of steel, and projects horizontally from the supporting standard 2 a distance just sufficient to provide a bearing for the winding belt 4. The extent to which the mandrel projects is indicated by dot-and-dash line *f—f* in Fig. 1.

The tube is preferably formed from two strips of material, A. B., which may be supplied from any suitable source. The inner surface of the inner strip B is coated with paraffin while the inner surface of the outer strip A is coated with a suitable adhesive. The mechanism for supplying and preparing the strips is not shown in the drawing as it forms *per se* no part of my invention. Any suitable means for this purpose may be employed, such for example as that disclosed in the patent to Osborn 863,208 granted August 13, 1907.

The tube winding belt, which is also of well known construction, is supported by the pulleys 5, 5 which are attached to the vertical shafts 6, 6, carried by the adjustable base board 7. The board 7 is pivoted at its center and maintained in position by a suitable connection as indicated at 9. The pulleys 6, 6, are driven continuously as will be hereinafter described.

Beyond the winding belt in the direction of the advancement of the tube are arranged suitable pressing rollers, 10. These rollers are four in number as shown in Fig. 2, but it is obvious that their number may be varied as desired. The rollers have concave surfaces for engaging the outer surface of the tube and are arranged in pairs, one pair in advance of the other and with their axes parallel. The rollers are mounted in suitable bearings in a rotary cage 11 provided with a hub 12 and mounted on a stationary sleeve 13 supported by a standard 14. The cage is held against longitudinal movement by means of collars 15, 16. The cage is rotated by means hereinafter described at a speed corresponding to that of the tube and is provided with means to cause the pressing rollers to rotate on their own axes. In the embodiment of the invention shown and described the cage is provided along one side with a shaft 17, supported in bearings 18 and extending between the shafts of the rollers of the respective pairs, which project at that side beyond their bearings. Ar-

ranged on their projecting ends of the shafts are worm gears 19 (only two of which are shown) which engage suitable spirals (not shown) on the shaft 17. The shaft 17 is driven during the rotation of the cage by means of a spur gear 20 meshing with a stationary gear 21 carried by the bearing sleeve 13 of the cage.

The forming and inserting mechanism for the closure disks will now be described. As stated above two closures are provided for each tube section, every other one being provided with a central perforation. The closures are preferably cut from a continuous web which may be supplied in any suitable manner and is fed into the machine by means of intermittently operated feed rollers, 22, 23. The rollers are mounted upon vertical axes carried by a suitable standard 24 on the wing of the table. The feed rollers are operated intermittently by a cam shaft 25 extending across the broad end of the machine, which cam shaft also operates the devices for forming and inserting the closures, making one complete revolution for each closure. In order that the closures may each be closely adjacent to the lines of division when the tube is cut into sections it is necessary that the first closure inserted for any given receptacle follow closely upon the last closure of the preceding receptacle section. To accomplish this, the cam shaft is caused by means hereinafter described to make two complete revolutions each time it is set in motion thereby forming and inserting two closures—first an imperforate one to form the bottom of a receptacle and then a perforated closure to form the top of the next receptacle—and then to remain inactive until the tube is advanced a distance equal to the desired height of the receptacle when it is again set in motion for its next operation. To operate the feed rolls from the cam shaft the said shaft is provided with a sector shaped cam 26 (see Fig. 2) which works in a strap or box 27 forming part of a slide 28 working in ways 29 and 30 as shown. The end of the slide adjacent the feed rolls is bifurcated, the lower portion working in the slide 30, while the upper portion is provided with gear teeth (see Fig. 1) forming a rack bar 31. This rack bar meshes with a gear wheel 32 loosely mounted on the shaft of one of the feed rolls, which wheel, by means of a ratchet clutch (not shown) drives the roll intermittently in well known manner. The feed rolls are geared together by gears 33, 34 and a ratchet mechanism 35 is provided to prevent backward rotation. Mounted on the standard 2 and on a standard 36 in line therewith is a paper guide 37 (see Figs. 3 and 4) through which the paper passes from the feed rolls to the closure cutting and inserting mechanism. The standard 36 is recessed to form a die for coöperation with a punch 38 which forms the perforation in the disks which constitute the tops of the receptacles. The punch slides in bearings 39 and is actuated by means of a cam 40 on the hub of a gear 41 which has but one complete rotation for each cycle of operations (as will be presently described) and therefore forms perforations only at every other advancement of the closure strip.

From the punch 38 the strip passes along the guide 37 to the standard 2. In this standard the hollow mandrel of the tube forming mechanism is mounted as previously described and surrounding the mandrel is a larger recess 42 (Figs. 3 and 4) with which a punch 43 coöperates for cutting out the disks to form the receptacle closures. The punch 43 is mounted on a bar 44 carried by rods 45 (Fig. 1) sliding in bearings 46 and 47. Cams 48 on the crank shaft 25 (Figs. 1 and 3) actuate the punch 43 to form one disk for each rotation of the shaft 25. Sliding within the punch 43 is a two part closure forming member consisting of an inner rod 50 (Figs. 1, 3 and 4) and an outer sleeve 51. This member coöperates with the hollow mandrel 3 to flange the disks cut by the dies 42, 43 and by its continued movement forces the closure so formed through the mandrel into the tube formed thereon. The rod 50 is provided with a head 52 of a size corresponding substantially to the inner diameter of the flanged closure and between this disk and the end of the sleeve 51 is a ring 53 of rubber or other expansible material. The sleeve 51 is slidable on the rod 50 to a limited extent as allowed by the pin 54. The rod 50 is reciprocated by means of a sector-shaped cam 55 on the shaft 25 which works in a strap or box 56 carried by the rod, (see Fig. 3). The sleeve 51 is slidingly mounted in the standard 46 and the rod 50 is provided with an extension sliding in the standard 47. The sleeve 51 is provided with an enlargement 57 at its outer end to be engaged by cams 58 carried by the cam-shaft 25 to advance the sleeve on the rod 50 and thereby compress the rubber ring 53 to force the flange of the cap into contact with the inner surface of the tube. As shown in Fig. 4 the head 52, the ring 53 and the adjacent portion of the sleeve 51 are reduced in diameter to accommodate the flanged closure while the balance of the sleeve is substantially the same size as the bore of the tube. Fig. 4 also shows a closure X and a portion of the tube Y (of exaggerated thickness) with the parts in the position prior to the withdrawal of the plunger and after the closure flange has been forced into contact with the wall of the tube and advanced slightly away from the plunger by the continuously moving tube.

The paper out of which the closures are made is preferably saturated with paraffin which adheres to the paraffin on the inner surface of the tube and holds the closures in place.

Any suitable means may be employed for cutting the tube into separate receptacles but a preferred form of cutting mechanism is shown in the drawing and will now be described. This mechanism comprises a saw or other suitable rotary cutter 59 mounted on a continuously rotating shaft 60. This shaft is slidingly mounted in swinging arms 61 carried by a continuously rotating shaft 62 to be hereinafter described. The shaft 60 is provided with an enlarged screw threaded portion 63 which is adapted to engage a similar threaded socket 64 on a post 65 carried by the table 1, whereby the rotations of the shaft causes it to advance with the tube. The position of the post 65 is such that when it is engaged by the shaft 60 the saw is in proper position to cut the tube. A spring 66 is provided between the end of the shaft 60 and the adjacent arm 61 to return the saw to its initial position.

To draw the saw against the tube at the proper time the following mechanism is provided: The arms 61 are provided with upward extensions 67 to each of which is attached one end of a horizontal link 68 the other ends of which are supported by swinging arms 69, substantially parallel to the arms 61 and mounted on bracket 70 carried by the table 1. Carried by the ends of the links 68 adjacent to the arms 69 is a plate 71 which is adapted to be attracted by a pair of electro-magnets 72 suitably supported on a bracket 73. The electro-magnets 72 are in circuit with a suitable battery or other generator (not shown), which circuit is adapted to be closed at the proper intervals by a switch 74 arranged in the path of the advancing tube and adapted to be closed thereby.

This switch is mounted on a post 75 adjustable longitudinally of the table and comprises an arm 77 pivoted on the post to swing horizontally and normally held by a spring 78 (see Fig. 5) in the path of the advancing tube. Mounted on the side of the arm 77 toward the tube and insulated therefrom is a flat spring 79 provided with a contact point (see Fig. 1) which normally stands away from the arm 77. One wire of the circuit is attached to the spring 79. The spring 78 is stronger than the spring 79 so that the first effect of the advancing tube is to force the spring 79 into contact with the arm 77 thereby closing the circuit and energizing the magnets 72 which through the armature 71 draw the rotating saw 59 against the tube and the screw 62 into contact with the threaded socket 65. When the circuit is broken by the severed receptacle dropping away from the arm 77 the cutter is returned to its normal position with one of the arms 61 against a stop 81 carried by the bearing 82 of the shaft 62, by means of a spring 83 as shown in Fig. 5.

The mechanism for operating the various shafts in the manner described will now be described: A driving pulley 84 adapted to be continuously driven from any desired source of power is fast on a shaft 85 supported in suitable bearings 86 carried by the table 1. Fast on the shaft 85 is a sprocket wheel which through a chain 87 drives a short shaft 88 mounted in bearings 89 depending from the table. The shaft 88 drives through the medium of a sprocket chain 90, a short shaft 91 which carries at its end a bevel gear 92 meshing with a bevel gear 93 carried by the shaft 62 which extends longitudinally on the narrow portion of the table. The tube rolling belt 4 is driven from the shaft 62 by means of a bevel gear 94 meshing with a bevel gear 95 on the end of a shaft 96 supported in a bracket 97 (Fig. 2) carried by the base board 7 of the winding belt. The shaft 96 carries also a bevel gear 98 meshing with a similar gear 99 on the shaft 6 of one of the pulleys 5 of the belt 4. The shaft 6 is supported in a vertical bearing 100 carried by the bracket 97. In order for the base board to be adjustable the bevel gears 95 and 94 should be longitudinally movable on their respective shafts. This mechanism is not shown in detail for the reason that it is old in the art and forms no part of the present invention.

The rotating cage 11 is driven from the shaft 62 by means of a sprocket chain 101 and suitable sprocket wheels and the cutter shaft is similarly driven by means of the sprocket chain 102.

Fast on the shaft 85 is a clutch member 103 which coöperates with a clutch member 104 slidingly mounted on the hub of the gear wheel 41 and moved into engaging position by a spring 105 between the clutch member and the gear wheel. The clutch is of the stop-clutch type and is adapted to give to the driven part a single revolution and then bring it to a stop at the same point each time the clutch is operated. The clutch is thrown into operation whenever a receptacle is cut from the advancing tube by means of an electro-magnet 106 in circuit with the switch 74 and arranged adjacent to the clutch shipper arm 107 (see Fig. 2). The gear 41 meshes with a gear 108 on the cam shaft 25, the gear 108 having half the number of teeth of the gear 41 so that the shaft 25 makes two revolutions for each revolution of the gear 41.

The operation of the machine will now be briefly described:

The machine is set in operation by connecting the pulley 84 with a suitable con-

tinuously rotating shaft running at the desired speed. Suitable material being supplied to the machine, a continuous tube is wound on the mandrel 3 by means of the belt 4 and rollers 10 driven continuously from the shaft 85 by the chain 87 and connections.

When sufficient tube has been formed for the end to reach and close the switch 74 and close the circuit through the magnets 72 and 106, the magnet 72 draws the cutter 59 into contact with the tube and the threaded shaft of the cutter into the socket 64 of the post 65 to advance the cutter with the tube during the cutting operation. The tube is cut between the two closures inserted at each receptacle length. The imperforate closure is the first of each pair to be inserted and has its flange extending toward the perforated closure and the tube is cut close to face of the perforated closure thereby forming a receptacle with a flush top and an inset bottom.

The energizing of the magnet 106 withdraws the stop from the clutch mechanism thereby giving the gear wheel 41 one complete revolution. The gear wheel 41 meshes with the pinion 108 on the cam shaft and gives that shaft two complete revolutions. The first operation performed by the rotation of the cam shaft is the feeding forward of the closure forming strip the necessary distance through the medium of the cam 26, rack-bar 31 and feed rollers 22 and 23. As soon as the strip comes to rest, the cams 48 reciprocate the bars 45 which carry the punch 43 which coöperates with the die 42 to cut a disk from the strip. At the same time the cam 55 engages its strap 56 to advance the closure forming and inserting members 50, 51, which engage the disk just cut by the punch 43 and force the same through the hollow mandrel into the tube thereby flanging the disk in the manner illustrated. Just as the member 51 reaches the limit of its forward movement the cams 58 engage the collar 57 on the sleeve 51 and move the sleeve forward slightly relatively to the rod 50 and head 52 thereby compressing the rubber ring 53 which forces the flange of the closure against the inner side of the tube as shown in Fig. 4. The withdrawal of the parts 50, 51 completes the operations performed by the first revolution of the shaft 25. The second revolution of the shaft causes a second closure (the perforated one) to be formed and inserted, the tube having meanwhile advanced a distance equal to the depth of the flange of the first closure. During this portion of the cycle of operations the punch 38 is operated to perforate the strip at a point corresponding to the center of the closure to be formed during the second revolution of the shaft 25 during the next cycle of operations.

If desired to form receptacles having open tops, the punch 38 may be dispensed with and gears of equal size substituted for the gears 41 and 108 thereby giving the shaft 25 but one revolution for each cycle of operations.

What I claim is:

1. In a machine for forming receptacles, the combination of means for forming a tube from the free end of a web of indefinite length, means for applying to said tube transverse end-forming pieces and means for cutting sections from said tube.

2. In a machine for forming receptacles, the combination of means for forming a tube from a continuous length of material and advancing said tube, means for applying transverse end-forming pieces to said tube as the same reaches a definite point in its advance and means for cutting sections from said tube.

3. In a machine for forming receptacles, the combination of means for forming a tube, means for inserting end forming divisions in said tube and means for cutting said tube into sections.

4. In a machine of the character described, the combination of means for forming and advancing a continuous tube having partitions at intervals there-in, and means for cutting said tube into sections.

5. In a machine of the character described, the combination of means for forming and continuously advancing a tube having partitions at intervals there-in, and means for cutting sections from said advancing tube.

6. In a machine of the character described, the combination of means for forming and continuously advancing a tube, means for inserting partitions in said advancing tube, and means for cutting sections from said advancing tube.

7. In a machine of the character described, the combination of means for forming and continuously advancing a tube, means for inserting partitions in said advancing tube, and means actuated by said advancing tube for cutting sections from said tube.

8. In a machine for forming receptacles, the combination of a hollow mandrel, means for forming a tube around said mandrel, means for inserting end forming disks through said mandrel and into the tube, and means for cutting said tube into sections.

9. In a machine for forming receptacles the combination of a hollow mandrel, means for forming a tube around said mandrel, a plunger mounted to reciprocate through said tube for forcing end forming disks into said tube.

10. In a machine for forming receptacles, the combination of a hollow mandrel, means for forming a tube around said mandrel, a plunger mounted to reciprocate through said mandrel, means of positioning a disk

of larger size than the bore of said mandrel in front of said plunger, whereby a flange is formed on said disk and the disk inserted in the tube.

11. In a machine for making receptacles, the combination of a hollow mandrel, means for forming a tube thereon, a cutting die arranged adjacent to the end of the mandrel, means for feeding a strip of material across said die, a cutter coöperating with said die to cut an end forming disk therefrom, and a plunger reciprocating through said mandrel and adapted to force said disk through said mandrel and into the tube formed thereon.

12. In a machine for forming receptacles, the combination of a hollow mandrel, a support for one end of said mandrel said support having a recess of larger diameter than said mandrel concentric therewith and forming a cutting die, means for feeding a strip of material across said die, a cutter cooperating with said die to cut disks therefrom, a plunger mounted to reciprocate through said cutter and mandrel and adapted to form a flange on said disk and insert the disk into the tube on said mandrel, said plunger consisting of an inner stem provided with a head, a sleeve on said stem, a rubber ring on said stem between said head and said sleeve and means for moving said sleeve relatively to said stem when said plunger is projected into the tube to thereby expand said flange into engagement with the tube.

13. In a machine for making receptacles, the combination of means for forming and advancing a tube, means for inserting end forming closures at intervals in said tube, means for cutting said tube into sections, a member arranged in the path of movement of said tube and means operated by the engagement of said tube with said member for causing the operation of said tube cutting means and said closure inserting means.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."