Aug. 23, 1932. T. FARROW 1,873,366

MACHINE FOR FORMING THE ENDS OF PAPER TUBES

Filed March 19, 1931 3 Sheets-Sheet 1

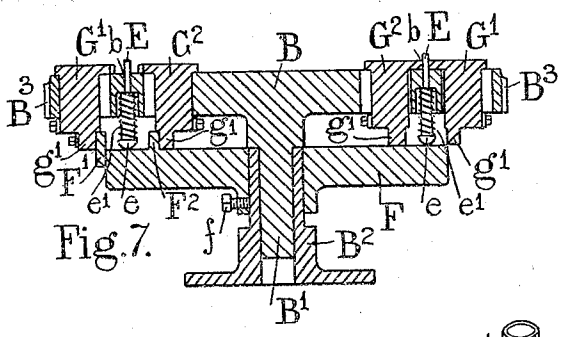


Fig.7.

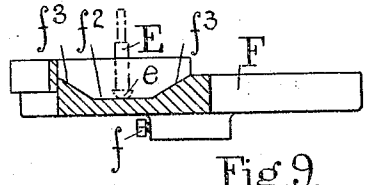


Fig.9.

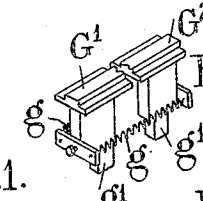


Fig.12.

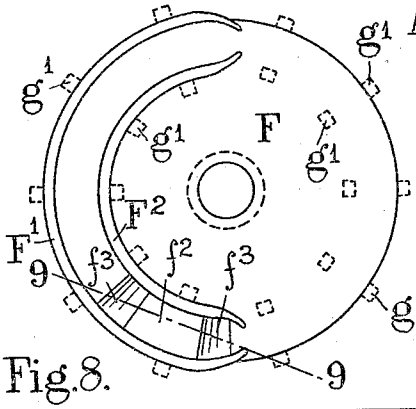


Fig.8.

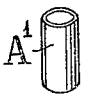


Fig.1.

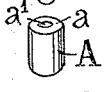


Fig.2.



Fig.10

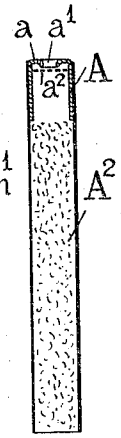


Fig.3.

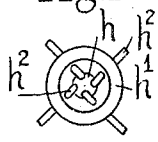


Fig.11.

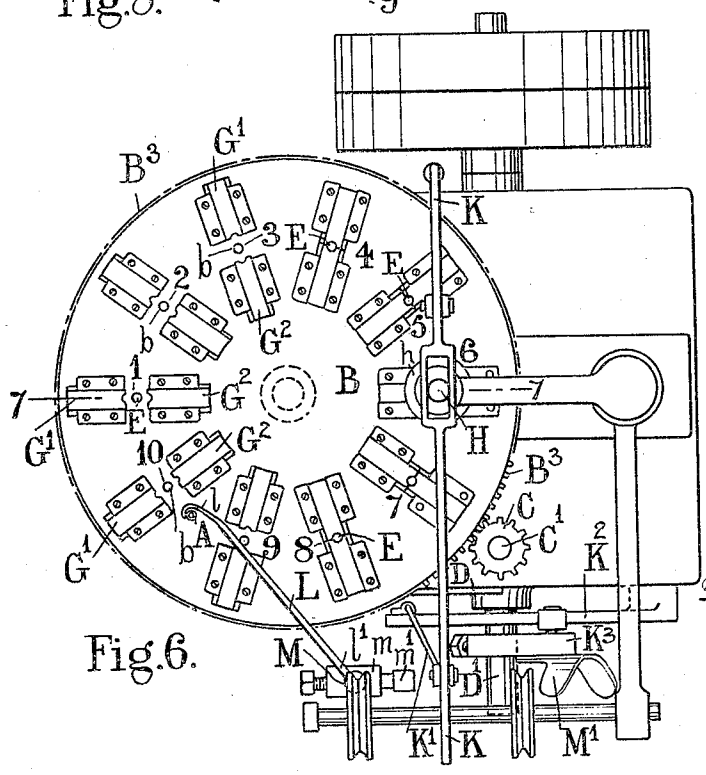


Fig.6.

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Aug. 23, 1932. T. FARROW 1,873,366

MACHINE FOR FORMING THE ENDS OF PAPER TUBES

Filed March 19, 1931 3 Sheets-Sheet 2

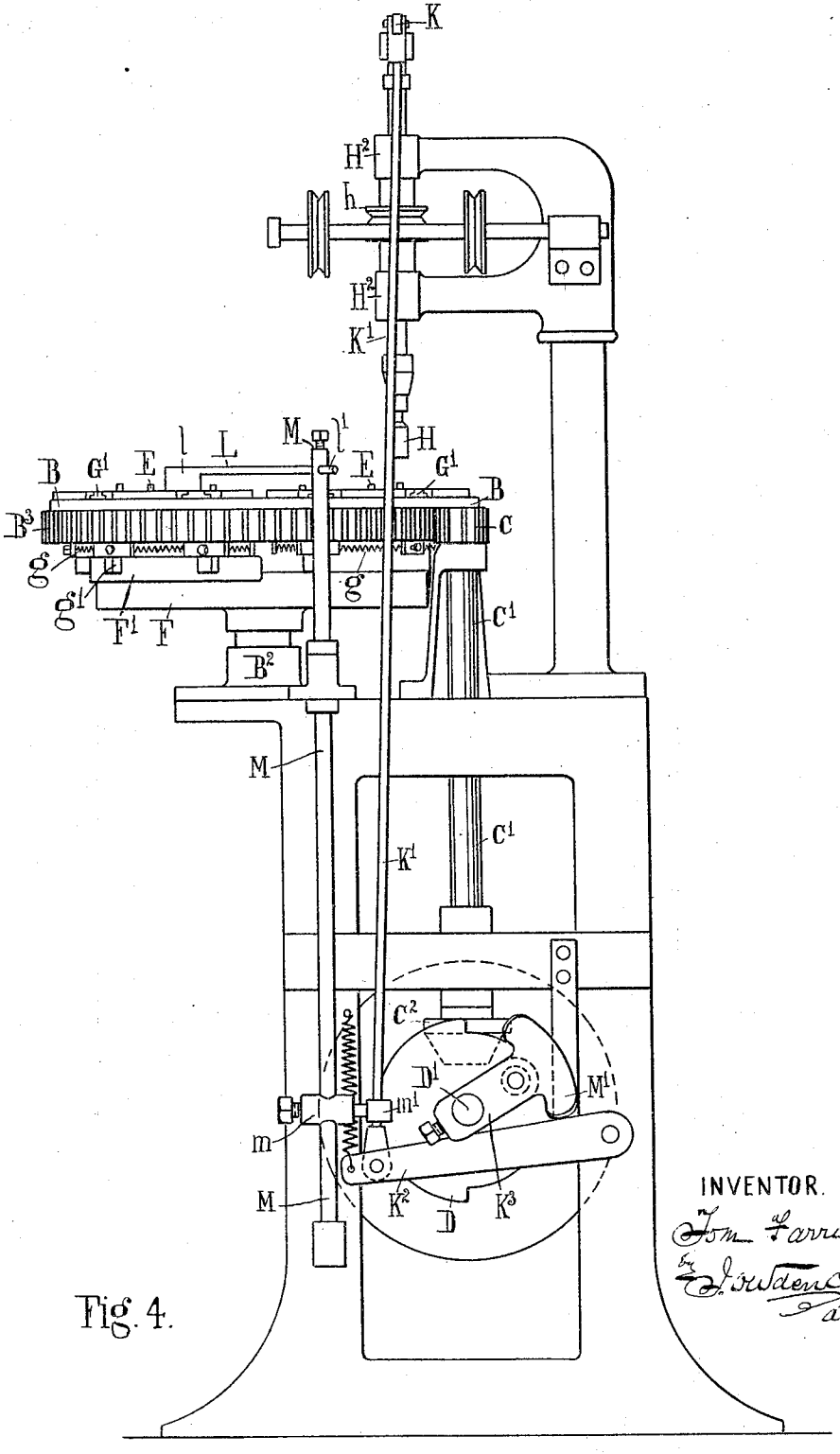


Fig. 4.

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Aug. 23, 1932. T. FARROW 1,873,366

MACHINE FOR FORMING THE ENDS OF PAPER TUBES

Filed March 19, 1931 3 Sheets-Sheet 3

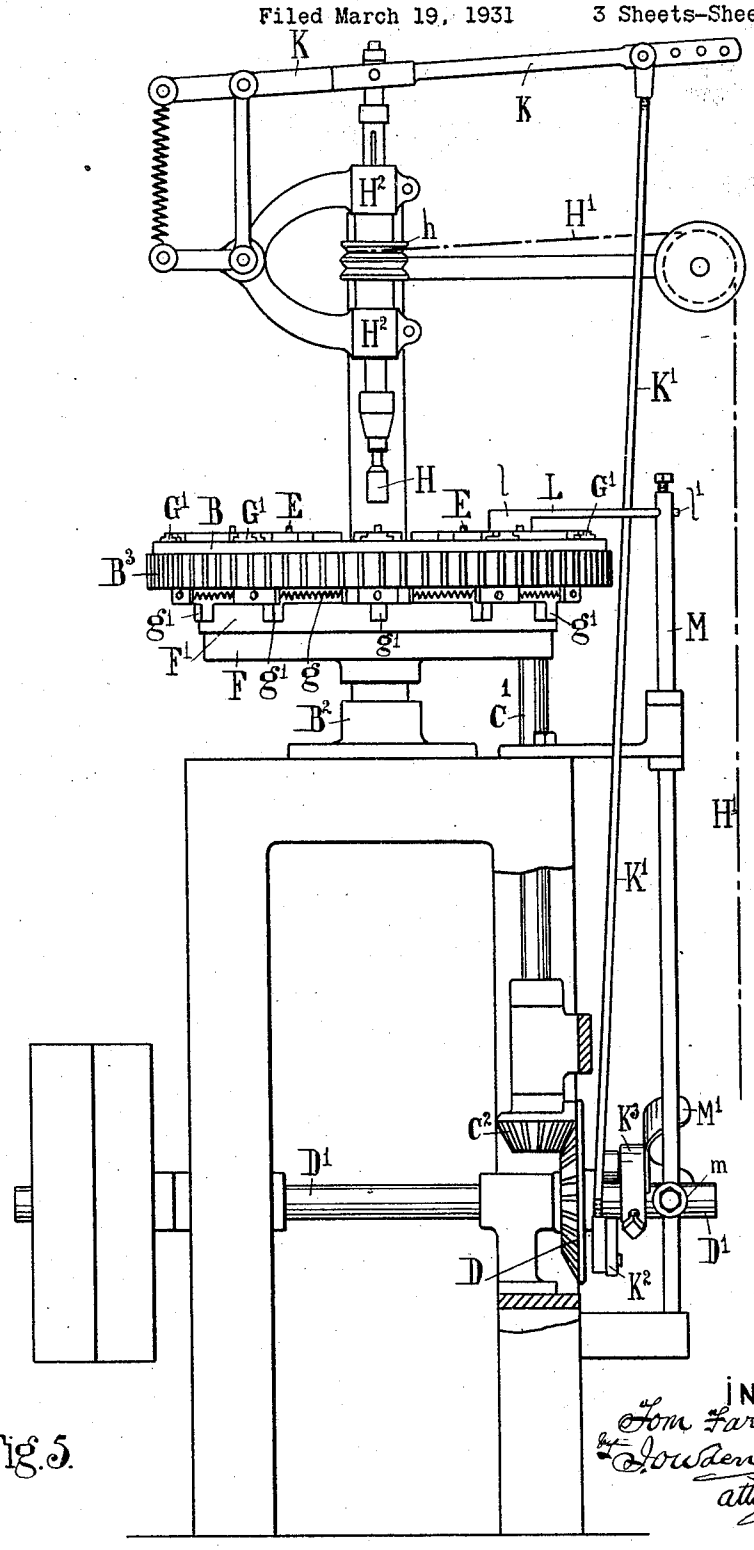


Fig. 5.

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Patented Aug. 23, 1932 1,873,366

UNITED STATES PATENT OFFICE

TOM FARROW, OF ASHTON-UNDER-RYNE, ENGLAND

MACHINE FOR FORMING THE ENDS OF PAPER TUBES

Application filed March 19, 1931, Serial No. 523,761, and in Great Britain May 27, 1930.

The invention relates to improvements in paper tubes such as those used for insertion in the ends of cigarettes and in machines for forming such tubes.

The tube according to the invention is formed of a number of layers or convolutions of paper which are spun over at one end so that the bore or central aperture at such end is of less diameter than that of the tube thus enabling the latter to serve as a receptacle or housing for a disc or wad of absorbent material at the end of the cigarette.

The machine for spinning over the ends of the tubes comprises essentially an intermittently rotating table provided with a number of upwardly projecting pins onto each of which a tube is placed and is carried thereon underneath a revolving pressing or spinning tool controlled by cam or other mechanism to be lowered into engagement with the end of the tube when the tube is stationary below it, the intermittently rotating table having a dwell as each pin comes below the revolving tool.

The invention will be described with reference to the accompanying drawings:—

Fig. 1 is a perspective view of paper tube before having its end spun over.

Fig. 2 is a perspective view of finished tube after having its end spun over according to the invention.

Fig. 3 is a longitudinal section through a cigarette having a tube formed according to the invention incorporated in the end thereof.

Fig. 4 is a side elevation of the machine for forming or spinning over the end of the tube.

Fig. 5 is a front elevation thereof.

Fig. 6 is a plan of same.

Fig. 7 is a section on line 7—7 of Fig. 6.

Fig. 8 is a plan view of stationary cam plate situated below the revolving table of the machine.

Fig. 9 is a section on line 9—9 of Fig. 8.

Fig. 10 is a sectional elevation on a larger scale of one of the pins carrying the tubes and of the lower portion of the revolving tool for forming or spinning over the end of the tube.

Fig. 11 is a plan view of the revolving tool from below.

Fig. 12 is a perspective view of a gripper device which prevents rotation of a tube on its pin whilst being operated upon by the revolving tool.

The tube A (Fig. 2) for insertion in the end of a cigarette as shown in Fig. 3 is formed from a paper tube A^1 Fig. 1 having a number of convolutions or layers of paper to make it sufficiently rigid. The tube A is formed from the tube A^1 by spinning or pressing over one end of the tube A^1 to produce an inturned flange *a* leaving a central bore or aperture a^1 of less diameter than the diameter of the tube A. A disc a^2 or a wad of absorbent material is placed in the tube A adjacent to the inturned flange *a* and the tube is then inserted in the end of the cigarette A^2 as shown in Fig. 3. The cigarette A^2 is manufactured so that there is no tobacco at the end where the tube A is inserted or the tobacco is removed therefrom before the insertion of the tube.

The machine for spinning over or forming the inturned flange *a* of the tube A comprises a table B having a central downwardly projecting stem B^1 carried in a foot step bearing B^2 supported by the framing of the machine. A spur wheel B^3 is formed on or affixed to the circumferential edge of the table B and is driven by a spur pinion C on the upper end of a vertical shaft C^1. The lower end of the shaft C^1 carries a bevel wheel C^2 which is driven from a bevel wheel D on the driving shaft D^1. The bevel wheel D is mutilated, i. e. a number of teeth are omitted therefrom, so that the bevel wheel C^2 is only intermittently driven and consequently an intermittent rotation is given to the table B. In the drawings the wheel D is shown with half the teeth missing which will give to the table B a movement and a dwell of equal time. This however can be varied if desired by varying the number of teeth omitted from the wheel D.

The table B is provided with a number of vertical holes *b* each spaced at an equal angular distance apart and at equal distances from the centre of the table and a pin

or peg E projects from the underside of the table through each hole b. There may be any convenient number of holes b and pins E and the ratio of the gearing driving the table is such that the table B rotates an angular distance equal to the angular distance between two adjacent holes at each movement and then has a dwell or stationary period caused by the mutilated wheel D before again rotating through the same angular distance.

In the drawings the table is shown with ten holes b and pins E and the gearing driving the table is of such ratio that the table will rotate through one-tenth of a revolution i. e. 36° at each movement and as half the teeth are missing from the wheel D the periods of movement and dwell of the table will be of equal length.

Each pin E normally projects above the level of the table B a distance equal to the length of the tube A; after forming the flange a the tube A^1 projects above the top of the pin a distance equal to the amount by which it is shortened by the formation of the flange.

The lower end of each pin E is formed with a rounded head e which rests on a stationary plate or disc F affixed on the footstep bearing B^2 by the set screw f which permits of adjustment of the disc or plate F relative to the table B. A spring e^1 is arranged around each pin E between the head e thereof and the underside of the table B, which spring e^1 tends to withdraw the pin E from above the surface of the table.

A gripping device is mounted on the table B adjacent to each pin E and is adapted to grip the tube A on the pin during a part of the revolution of the table B so that the tube is held during the operation of the finishing or pressing tool H thereon. The gripping device comprises two sliding jaws G^1, G^2 connected by a pair of springs g which tend to force the jaws together on to the tube A. Each jaw is provided with a leg or projection g^1 which extends below the lower surface of the table and engages one of a pair of ramps or curved rails F^1, F^2 affixed on the upper surface of the stationary plate or disc F.

The ramps or rails F^1, F^2 are such a distance apart that when the legs g^1 of the jaws G^1, G^2 are in contact therewith, the latter are held open against the action of the springs g. When however the legs g^1 have moved, by the rotation of the table B, beyond the ramps or rails F^1, F^2 the springs g will close the jaws and grip the tube A on the pin E.

The tool H for forming the inturned flange a of the tube A is arranged to operate successively on each tube as the latter is brought beneath it by the rotation of the table B, the movement of the latter being so timed that the table B has a dwell or stationary period each time a pin E with a tube upon it is immediately below the tool H. The tool H is constantly driven at a high speed by the belt or rope H^1 passing around the pulley h on the tool and is moved vertically up and down in its bearings H^2 by the two armed lever K the outer end of which is connected by the connecting rod K^1 to a pivoted lever K^2 below the driving shaft D^1. A cam K^3 is mounted on the driving shaft D^1 which depresses the lever K^2 at each revolution of the shaft so that the tool H is brought down on to the upper end of a tube A each time a pin E stops below it, the cam K^3 being so arranged on the shaft D^1 that it engages the lever K^2 during the period the table B is stationary. The lower end of the tool H is formed as shown in Figs. 10 and 11 with a central projection h which passes into a corresponding central recess e^2 in the top of the pin E and an outer ring h^1 carrying four horizontal shaping pins h^2 which engage the end of the tube A^1 projecting above the pin E and as the head is lowered, press or spin over this portion of the tube to form the inturned flange a.

To remove the tube A from its pin E after the flange a has been formed by the tool H it is necessary that the pin E should be withdrawn from above the top of the table B and to permit of such withdrawal a recess f^2 with inclined sides f^3 is formed in the disc F in the track of the head e of the pin E so that when the pin E is above this recess it will be drawn down by the spring e^1 away from the table B and the tube A will be released.

Mechanism is provided for knocking the finished tube A off the table B into a suitable receptacle after the pin E has been withdrawn from the tube. This mechanism comprises an arm L, the end l of which is moved over the surface of the table by the rotation of a vertical shaft M to the top of which the other end l^1 of the arm L is affixed. The lower end of the vertical shaft M is provided with a horizontal arm m terminating in an enlarged end m^1 which projects into the path of a curved cam face M^1 mounted on the driving shaft D^1. Thus at each revolution of the shaft D^1 a rotary movement is imparted to the shaft M which causes the end l of the arms L to move over the surface of the table B and sweep the tube A off the table.

The operation of the machine is as follows:—

A tube A^1 is placed, whilst the table is stationary, by the operative on the pin at the position 1 on the table B which point is diametrically opposite the position 6 where the pressing or forming tool H is situated. At the point 1 the jaws G^1, G^2 of the gripper are held open by the ramps or rails F^1, F^2 so that the tube A^1 can be readily placed over the projecting portion of the pin. At each further intermittent movement of the table the pin E with the tube A^1 upon it is carried

from the position 1 to the position 2, from the position 2 to the position 3, after passing position 3, the legs g^1 of the jaws G^1, G^2 pass away from the ramps or rails F^1, F^2 so that the jaws are closed by the springs g on to the tube A^1 by the time the pin and tube have reached position 4. The further intermittent rotation of the table carries the pin and tube to position 5 and then to position 6 immediately below the tool H. There it is operated on by the pressing tool H during the period of dwell to form the inturned rim a on the tube and the tube after leaving this position is in its final form A but is still held by the gripper jaws G^1, G^2.

After passing from position 7 to position 8 the legs g^1 of the jaws G^1, G^2 again engage the rails or ramps F^1, F^2 and the jaws are opened and the tube A released. The recess f^1 in the disc F which allows of the withdrawal of the pin E by its controlling spring is also situated between the positions 8 and 9 so that the pin E is withdrawn from the tube A as soon as it has been released by the gripper jaws and the tube is then resting freely on the surface of the table without being held in any way. As soon as the pin E has been withdrawn the mechanism for knocking the tube A from the table comes into operation and the finished tube is removed thereby into any convenient receptacle. By the time the pin has reached position 10 the head e of the pin E has traveled out of the recess f^1 so that the pin again projects through the tables B and is ready to receive a new tube A^1 when it reaches the operative at position 1, the whole cycle of operations being then repeated on the new tube A^1.

It will be understood that the above described cycle of operations takes place with each pin E on each complete rotation of the table, the operative placing a new tube A on each pin E as it passes position 1. Thus in the machine described above having ten pins E and rotating one-tenth of a revolution at a time, ten tubes A are formed for each revolution of the table.

What I claim as my invention and desire to protect by Letters Patent is:—

1. A machine for pressing or spinning over the end of a paper tube to form an inturned rim at such end comprising the combination with an intermittently rotating table of a plurality of upwardly projecting pins thereon to receive the tubes, a revolving shaping tool below which the tubes are successively carried by the intermittent movement of the table, a cam for bringing the shaping tool into engagement with the end of each tube as it is stationary below the tool to form the inturned rim and means for causing the withdrawal of each pin below the surface of the table after the tube thereon has been acted upon by the shaping tool.

2. A machine for pressing or spinning over the end of a paper tube to form an inturned rim at such end comprising the combination with an intermittently rotating table of a plurality of upwardly projecting pins thereon to receive the tubes, a revolving shaping tool below which the tubes are successively carried by the intermittent movement of the table, a cam for bringing the shaping tool into engagement with the end of each tube as it is stationary below the tool to form the inturned rim, a gripping device adjacent to each upwardly projecting pin to grip the tube thereon at the period during which it is being operated upon by the shaping tool and means for causing the withdrawal of each pin below the surface of the table after the tube thereon has been acted upon by the shaping tool.

3. A machine for pressing or spinning over the end of a paper tube to form an inturned rim at such end comprising the combination with an intermittently rotating table of a plurality of upwardly projecting pins thereon to receive the tubes, a revolving shaping tool below which the tubes are successively carried by the intermittent movement of the table, a cam for bringing the shaping tool into engagement with the end of each tube as it is stationary below the tool to form the inturned rim, a pair of gripper jaws to grip the tube firmly on its upwardly projecting pin whilst being operated upon by the shaping tool, a spring to cause the gripper jaws to close on to the tube, a ramp device to open the jaws to release the tube after the latter has been moved away from the shaping tool by the rotation of the table, and means for causing the withdrawal of each pin below the surface of the table after the tube thereon has been acted upon by the shaping tool.

4. A machine for pressing or spinning over the end of a paper tube to form an inturned rim at such end comprising the combination with an intermittently rotating table of a plurality of upwardly projecting pins thereon to receive the tubes, a revolving shaping tool below which the tubes are successively carried by the intermittent movement of the table, a cam for bringing the shaping tool into engagement with the end of each tube as it is stationary below the tool to form the inturned rim, a pair of gripper jaws to grip the tube firmly on its upwardly projecting pin whilst being operated upon by the shaping tool, a spring to cause the gripper jaws to close on to the tube, a ramp device to open the jaws to release the tube after the latter has been moved away from the shaping tool by the rotation of the table, springs acting on the pins to cause the withdrawal thereof below the surface of the table after the tube thereon has been acted upon by the shaping tool and a stationary plate with a recess thereon arranged below the table, the said plate normally holding the pins in their raised po-

sition but allowing the springs to withdraw the pins when immediately above the recess in the plate.

5. A machine for pressing or spinning over the end of a paper tube to form an inturned rim at such end comprising the combination with an intermittently rotating table of a plurality of upwardly projecting pins thereon to receive the tubes, a revolving shaping tool below which the tubes are successively carried by the intermittent movement of the table, a cam for bringing the shaping tool into engagement with the end of each tube as it is stationary below the tool to form the inturned rim, a pair of gripper jaws to grip the tube firmly on its upwardly projecting pin whilst being operated upon by the shaping tool, a spring to cause the gripper jaws to close on to the tube, a ramp device to open the jaws to release the tube after the latter has been moved away from the shaping tool by the rotation of the table, springs acting on the pins to cause the withdrawal thereof below the surface of the table after the tube thereon has been acted upon by the shaping tool, a stationary plate with a recess therein arranged below the table, the said plate normally holding the pins in their raised position but allowing the springs to withdraw the pins when immediately above the recess in the plate and means for removing each finished tube from the table after the withdrawal of the pin on which it has been mounted.

6. A machine for pressing or spinning over the end of a paper tube to form an inturned rim at such end comprising the combination with an intermittently rotating table of a plurality of upwardly projecting pins thereon to receive the tubes, a revolving shaping tool below which the tubes are successively carried by the intermittent movement of the table, a cam for bringing the shaping tool into engagement with the end of each tube as it is stationary below the tool to form the inturned rim, a pair of gripper jaws to grip the tube firmly on its upwardly projecting pin whilst being operated upon by the shaping tool, a spring to cause the gripper jaws to close on to the tube, a ramp device to open the jaws to release the tube after the latter has been moved away from the shaping tool by the rotation of the table, springs acting on the pins to cause the withdrawal thereof below the surface of the table after the tube thereon has been acted upon by the shaping tool, a stationary plate with a recess therein arranged below the table, the said plate normally holding the pins in their raised position but allowing the springs to withdraw the pins when immediately above the recess in the plate and an oscillating arm for removing each finished tube from the surface of the table after the withdrawal of the pin on which it has been mounted.

7. A machine for pressing or spinning over the end of a paper tube to form an inturned rim at such end comprising the combination with an intermittently rotating table of a plurality of upwardly projecting pins thereon to receive the tubes, a revolving shaping tool below which the tubes are successively carried by the intermittent movement of the table, a cam for bringing the shaping tool into engagement with the end of each tube as it is stationary below the tool to form the inturned rim, a pair of gripper jaws to grip the tube firmly on its upwardly projecting pin whilst being operated upon by the shaping tool, a spring to cause the gripper jaws to close on to the tube, a ramp device to open the jaws to release the tube after the latter has been moved away from the shaping tool by the rotation of the table, springs acting on the pins to cause the withdrawal thereof below the surface of the table after the tube thereon has been acted upon by the shaping tool, a stationary plate with a recess therein arranged below the table, the said plate normally holding the pins in their raised position but allowing the springs to withdraw the pins when immediately above the recess in the plate, an oscillating arm for removing each finished tube from the surface of the table after the withdrawal of the pin on which it has been mounted and cam mechanism for operating said oscillating arm.

In testimony whereof I have hereunto set my hand.

TOM FARROW.