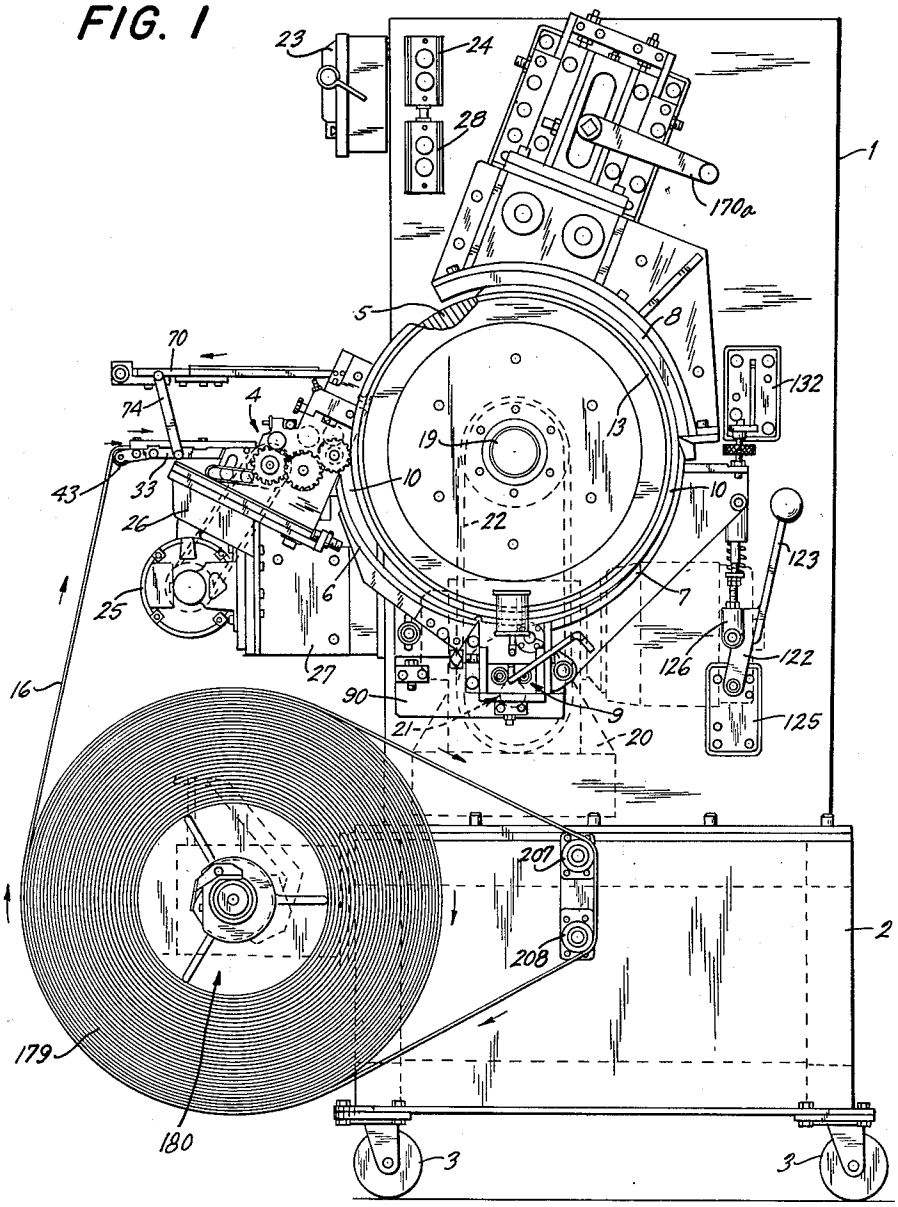
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MACHINE FOR MAKING PAPER STICKS

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FIG. 1



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MACHINE FOR MAKING PAPER STICKS

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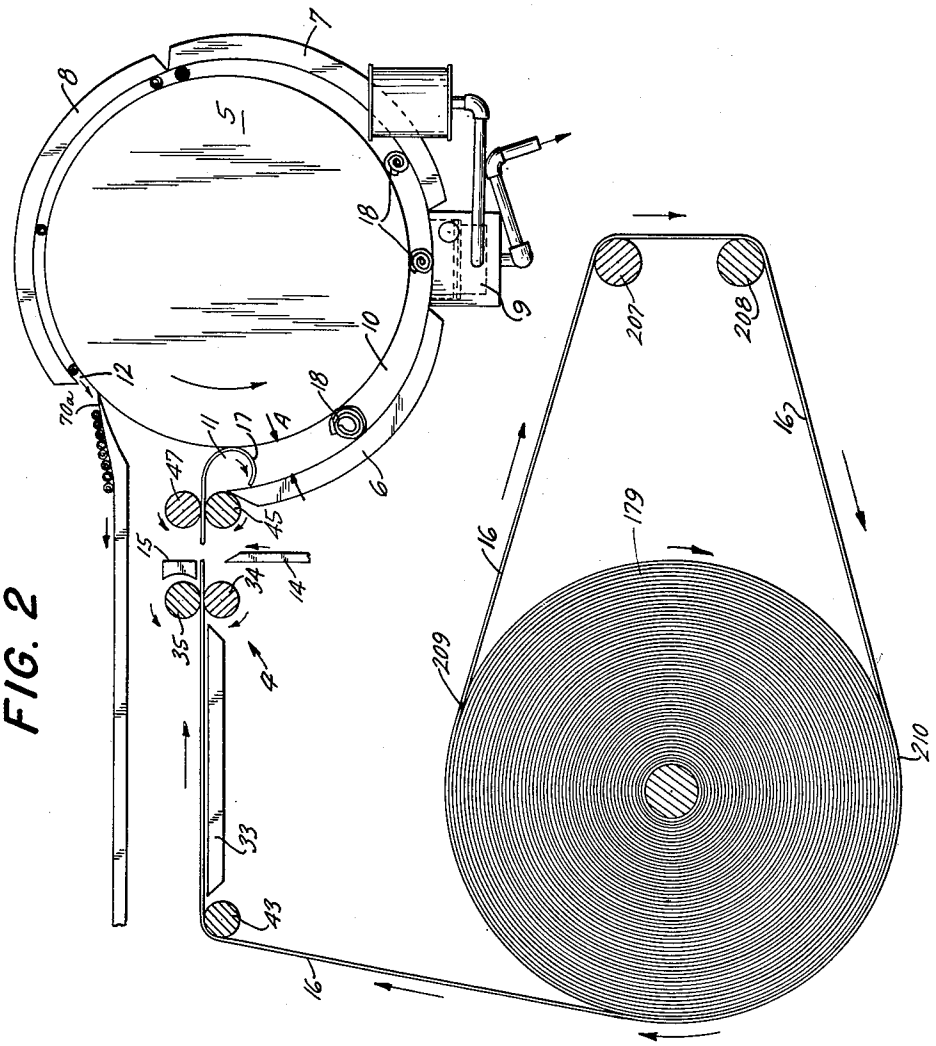


FIG. 2

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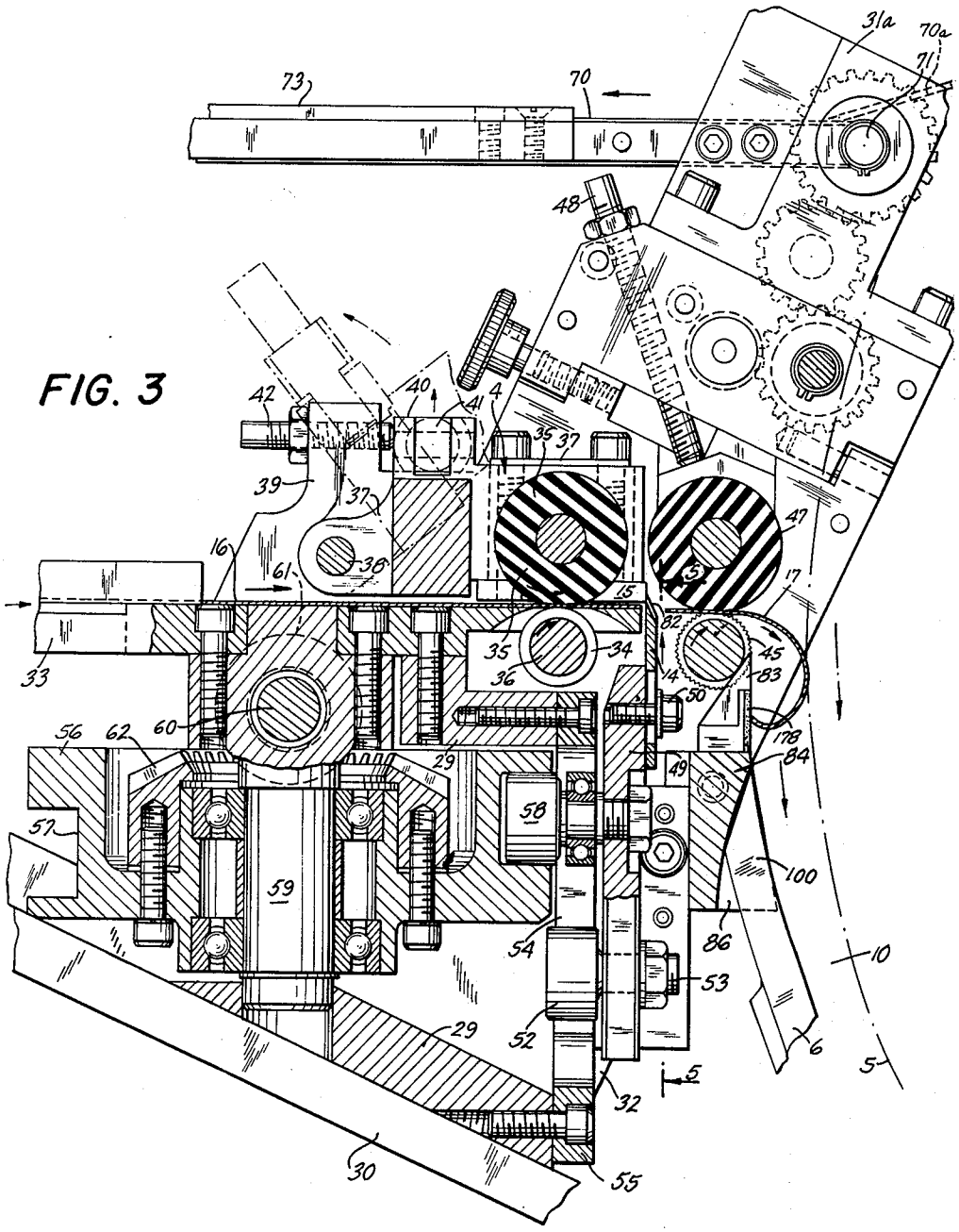
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MACHINE FOR MAKING PAPER STICKS

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FIG. 3



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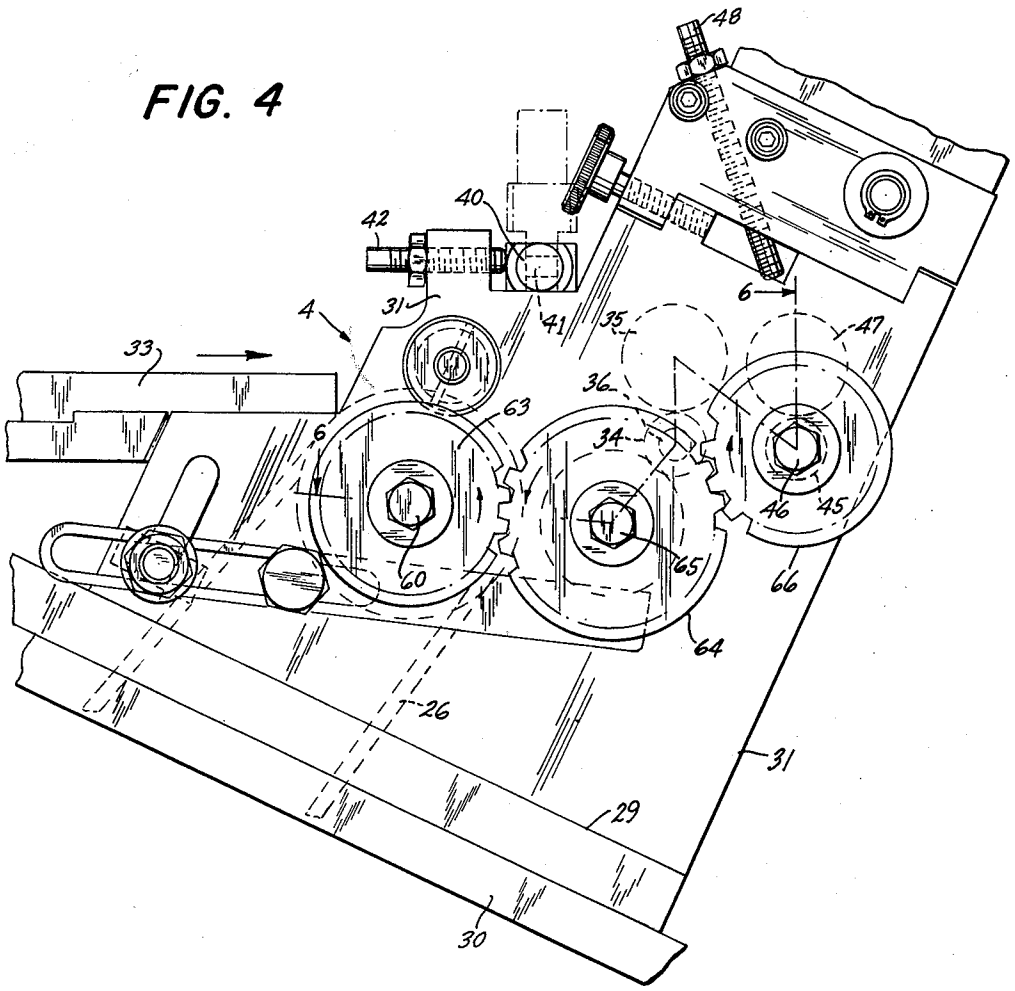
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MACHINE FOR MAKING PAPER STICKS

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FIG. 4



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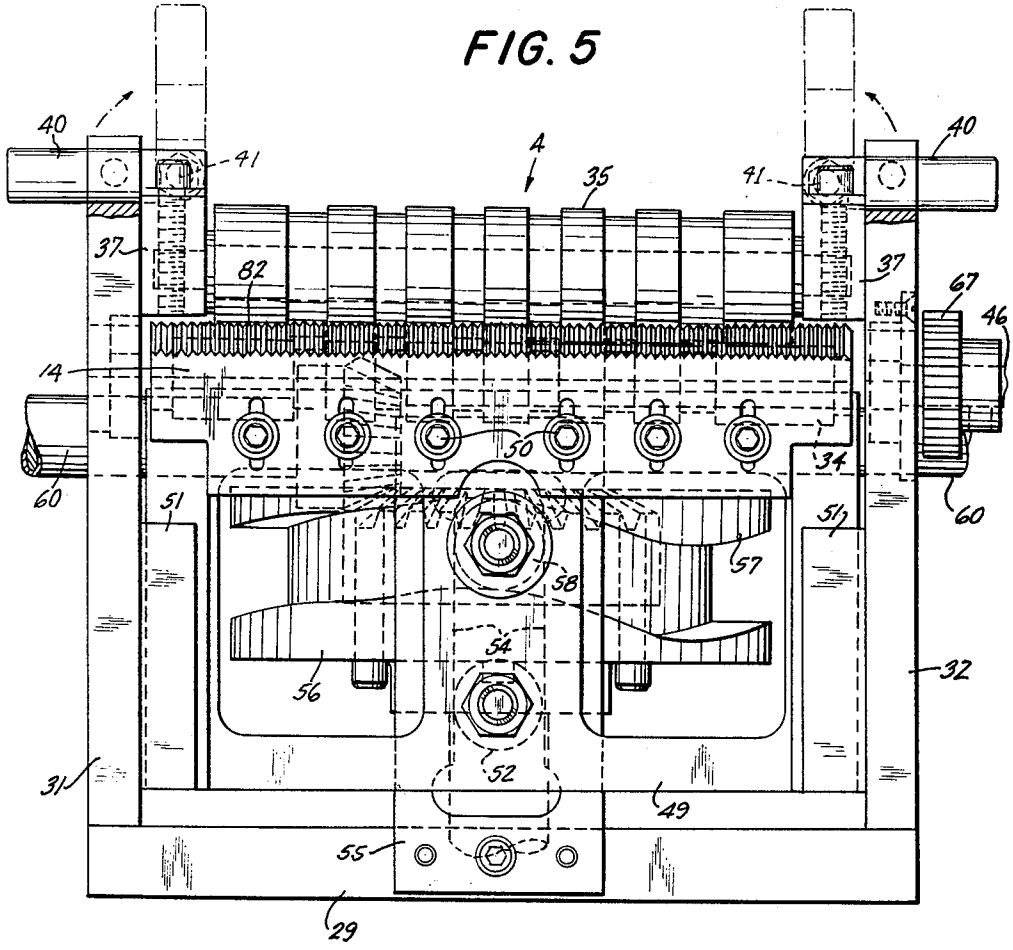
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MACHINE FOR MAKING PAPER STICKS

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FIG. 5



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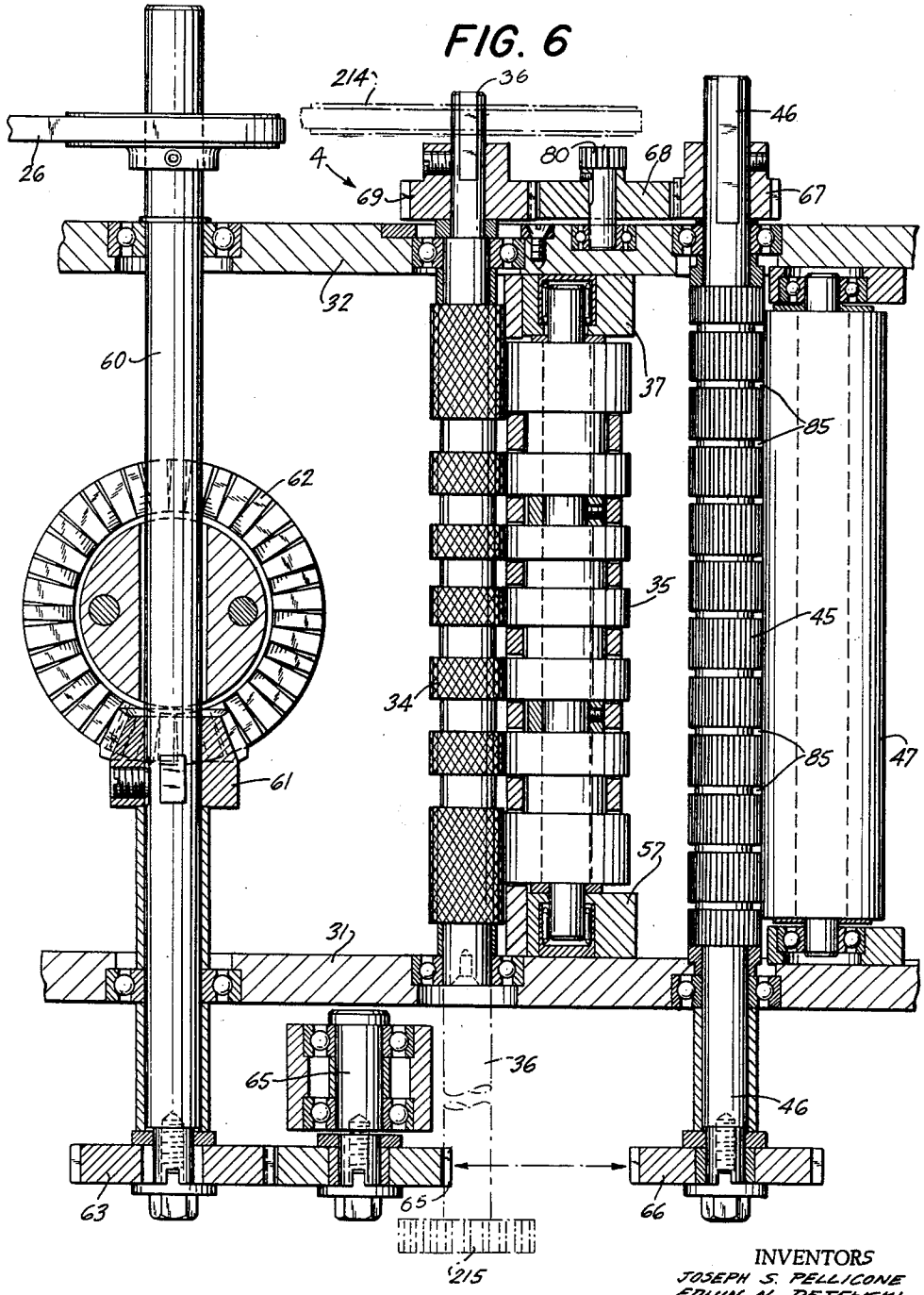
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MACHINE FOR MAKING PAPER STICKS

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FIG. 6



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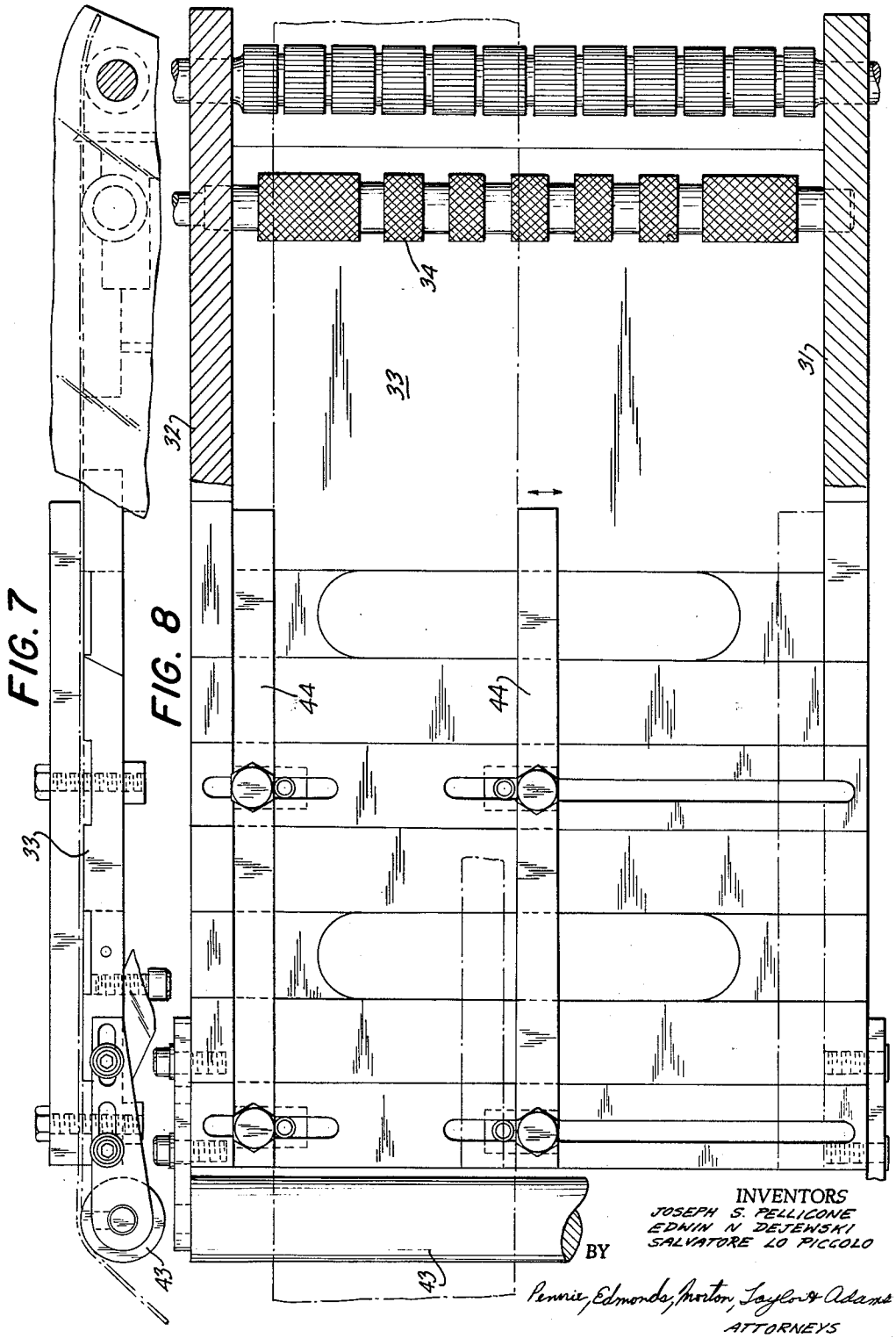


FIG. 7

FIG. 8

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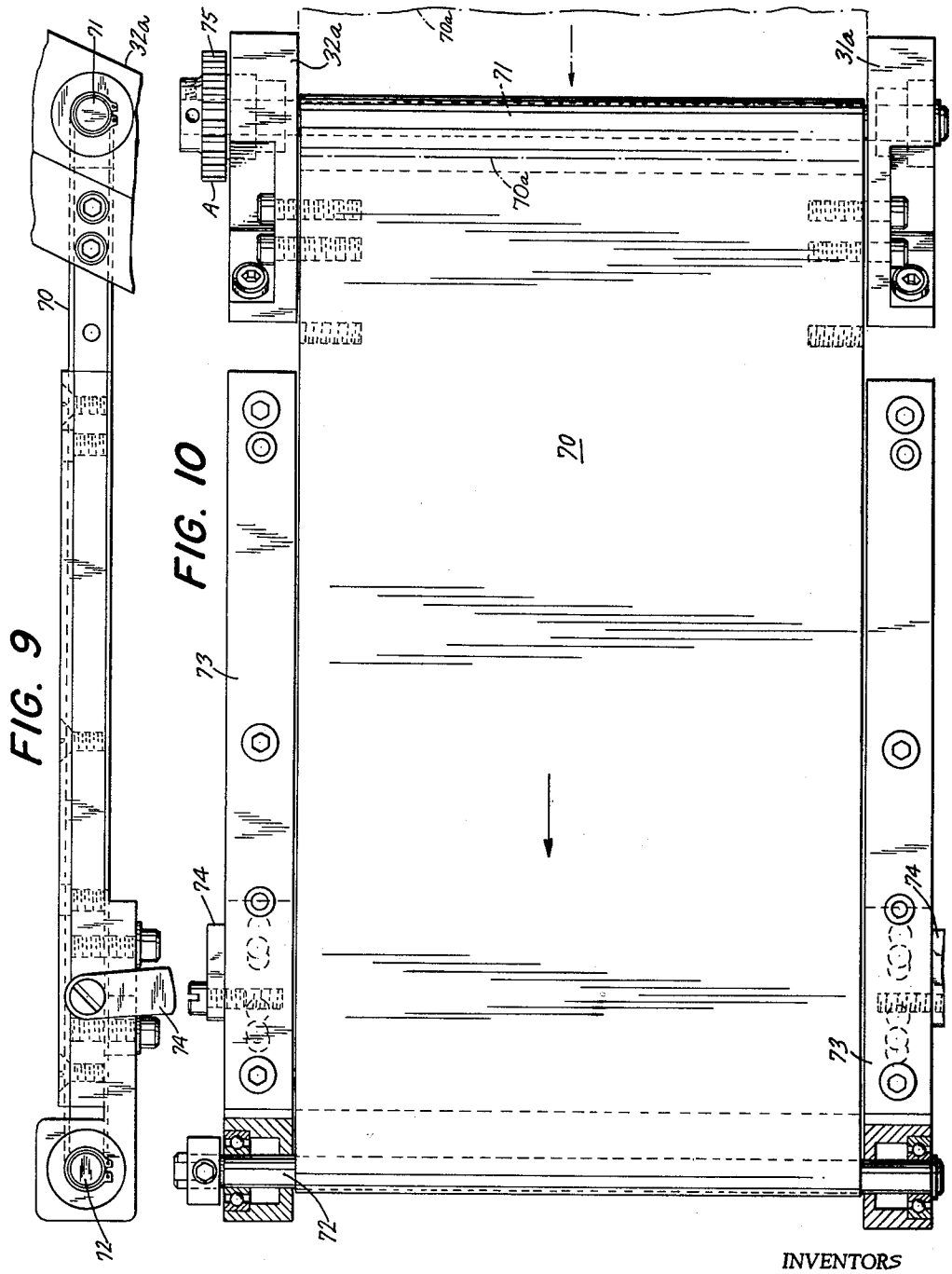


FIG. 9

FIG. 10

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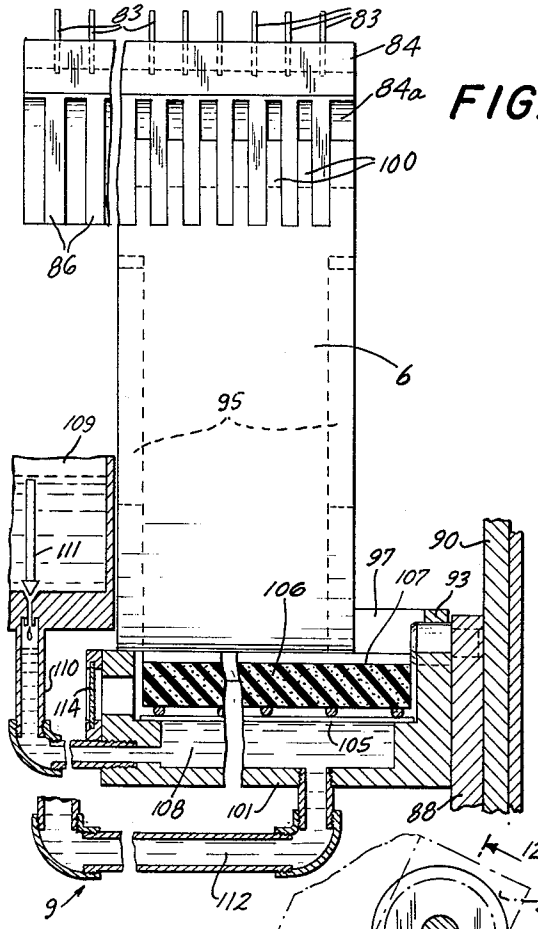


FIG. 14

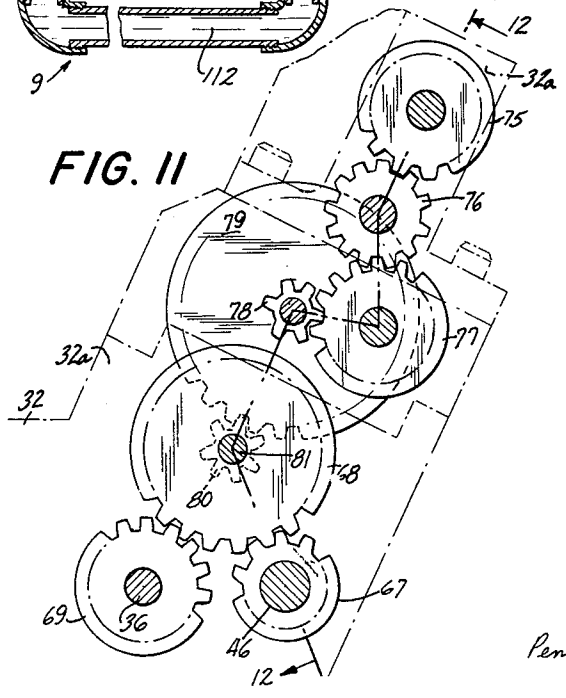
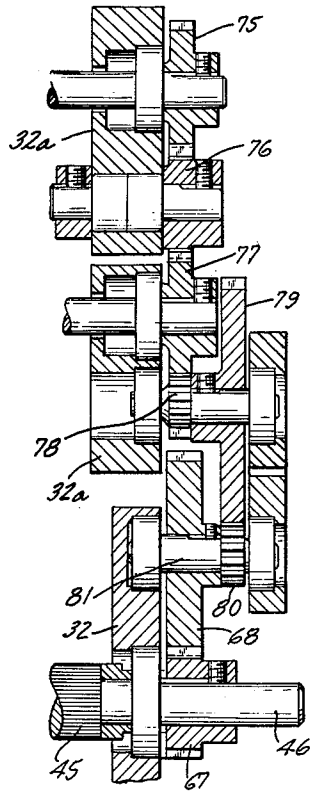


FIG. 11

FIG. 12



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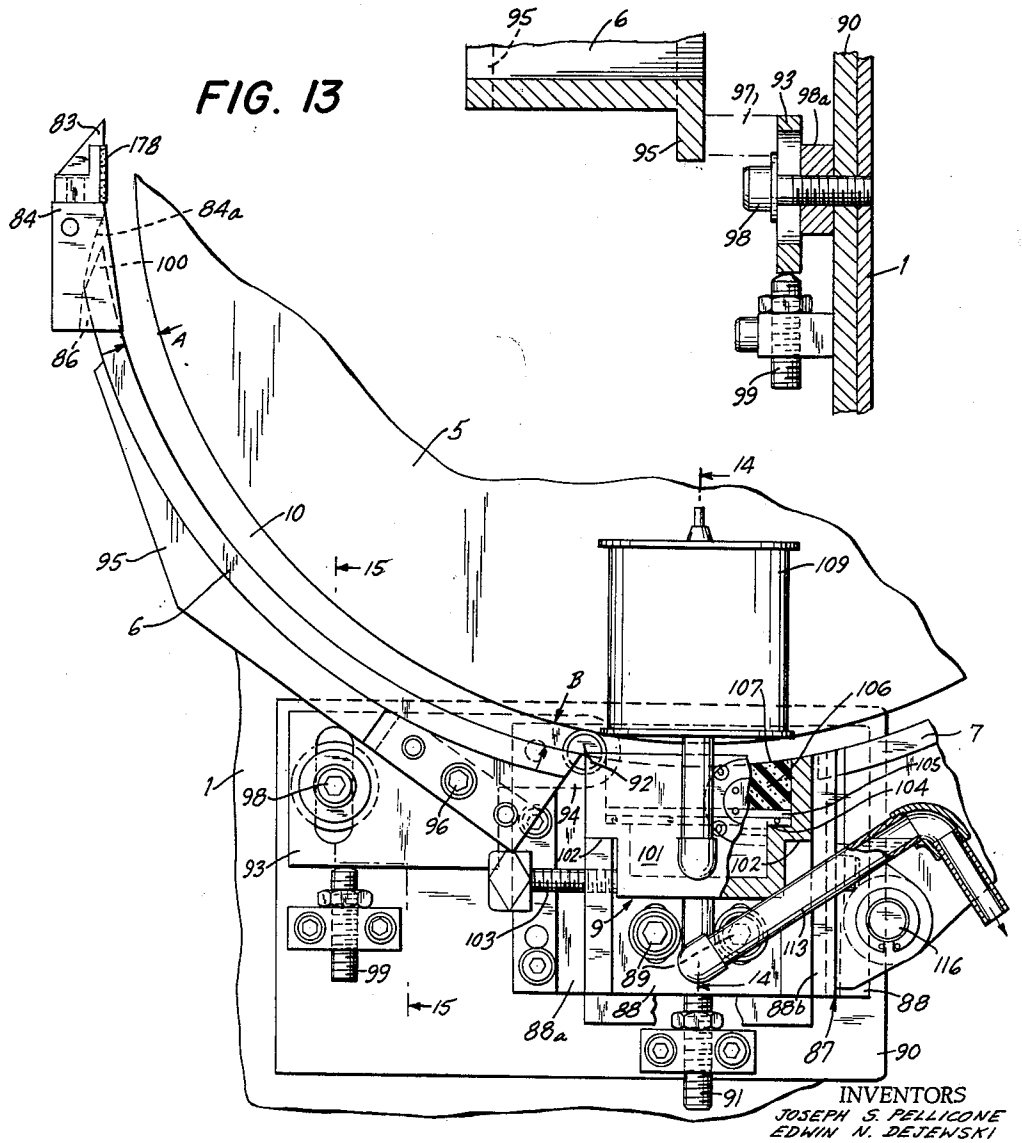
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MACHINE FOR MAKING PAPER STICKS

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FIG. 15



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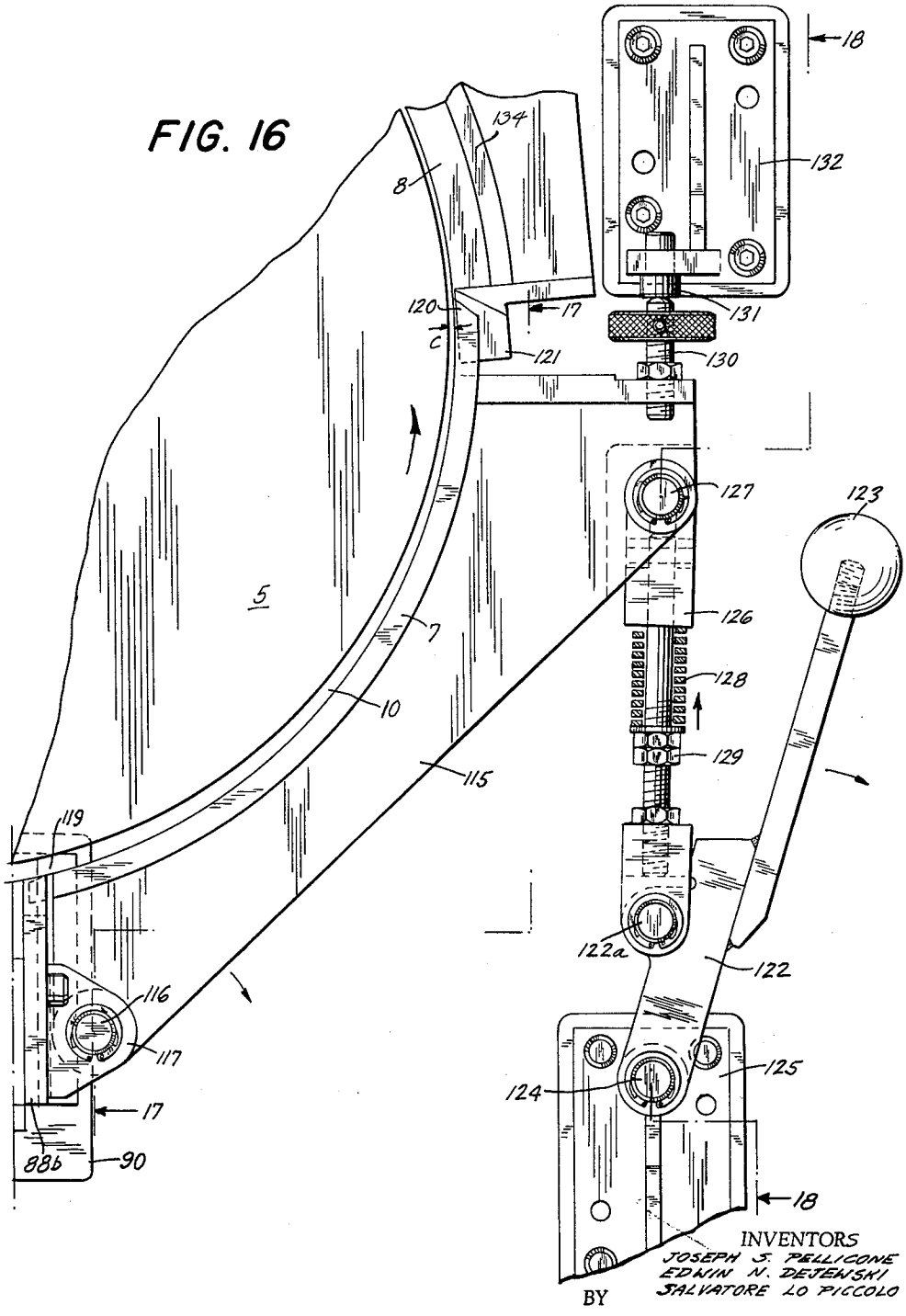
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FIG. 16



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FIG. 17

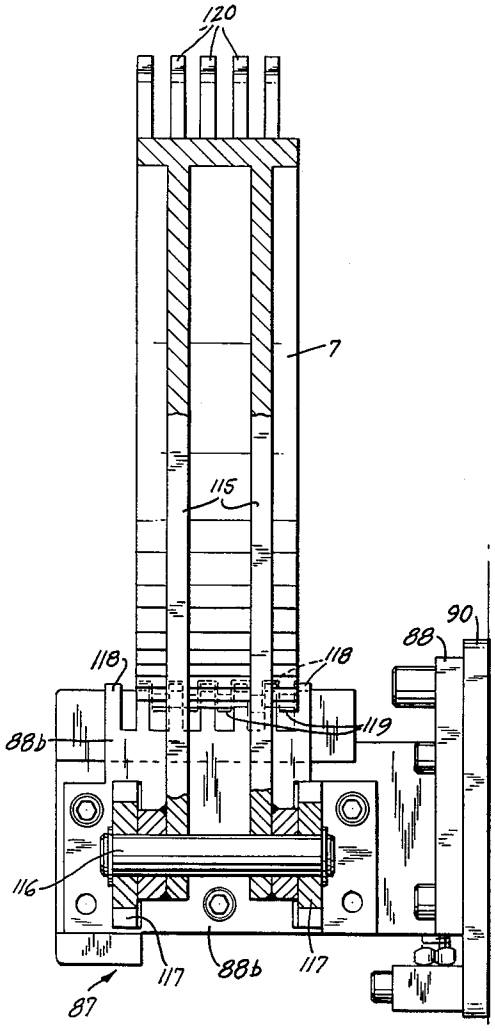
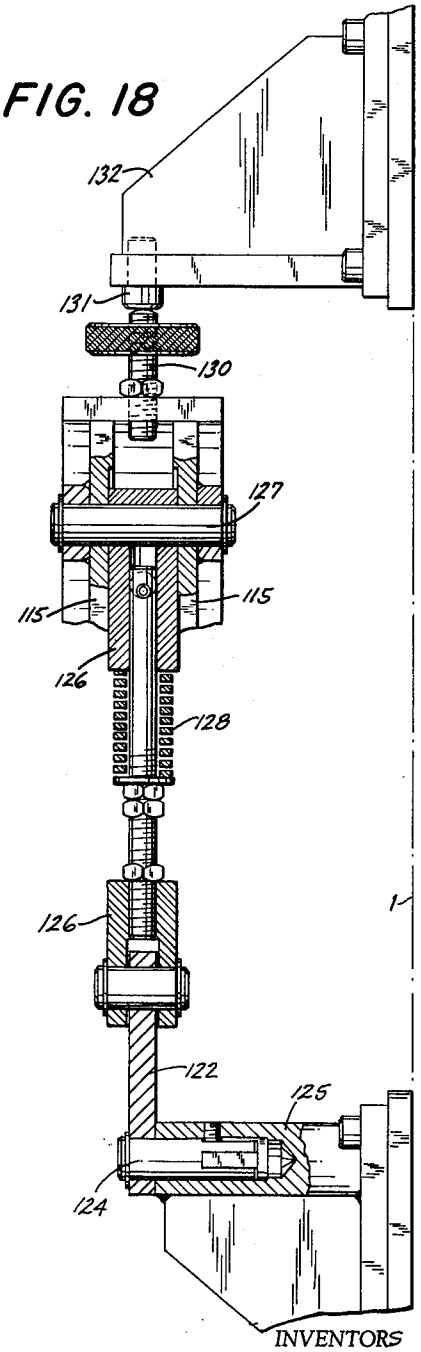


FIG. 18



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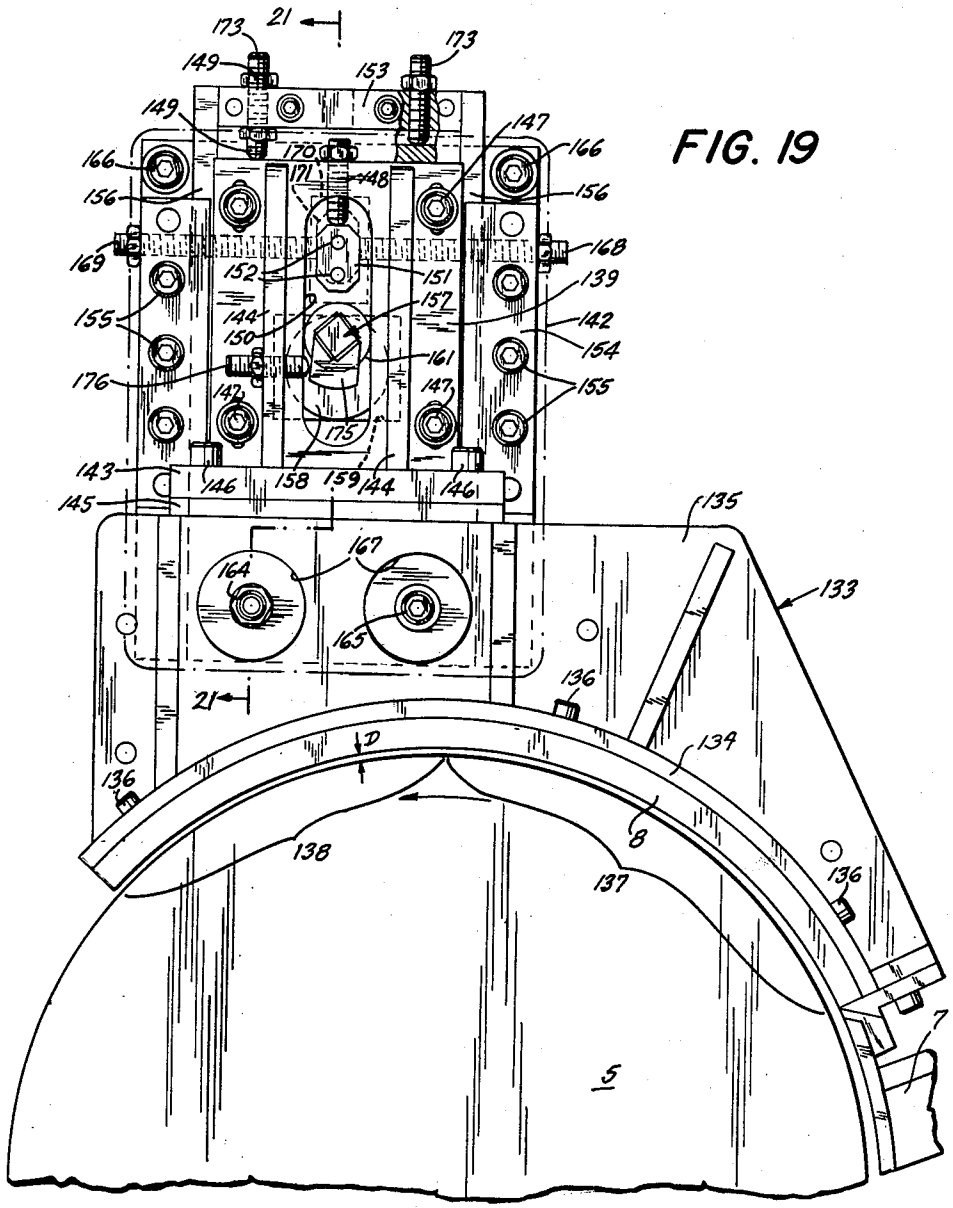


FIG. 19

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FIG. 20

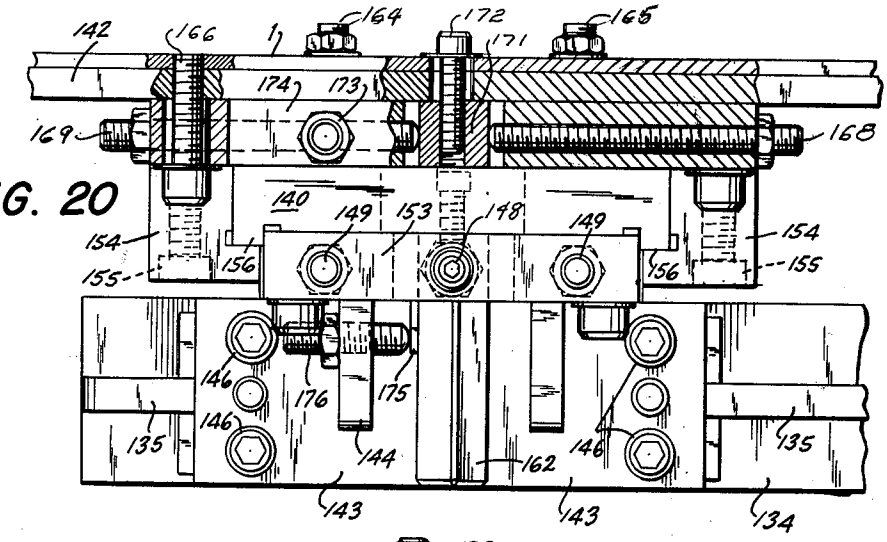


FIG. 21

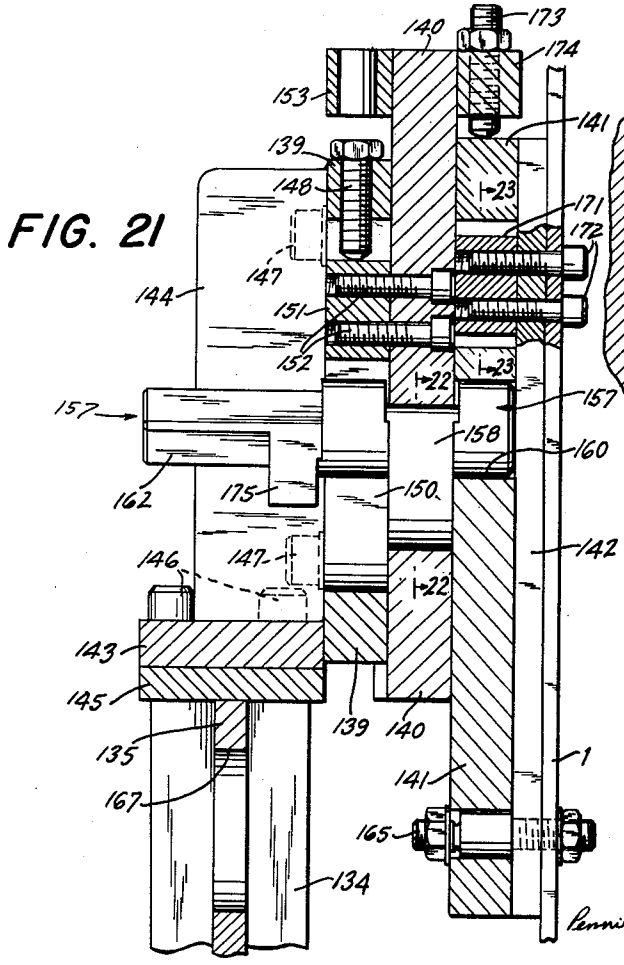


FIG. 22

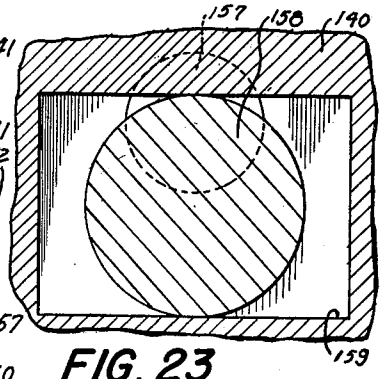
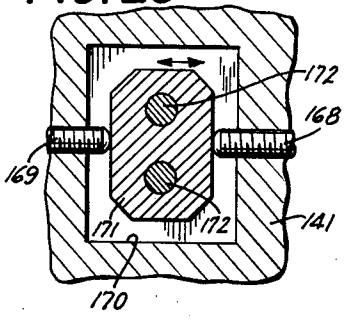


FIG. 23



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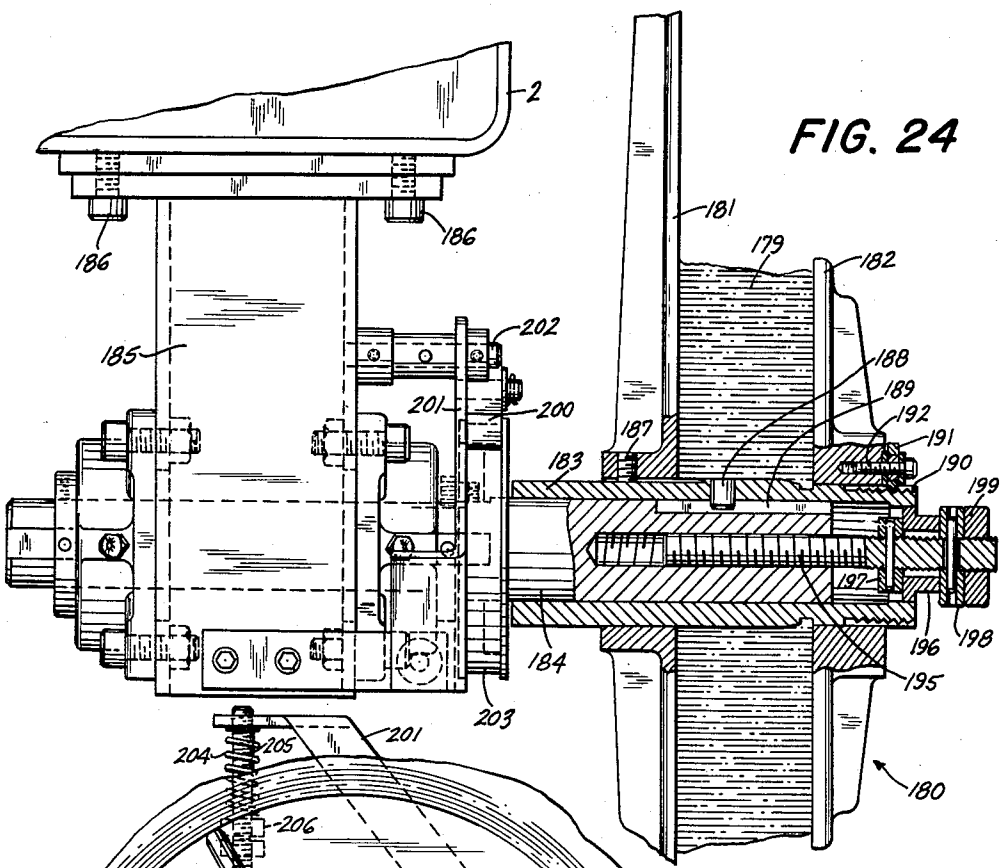


FIG. 24

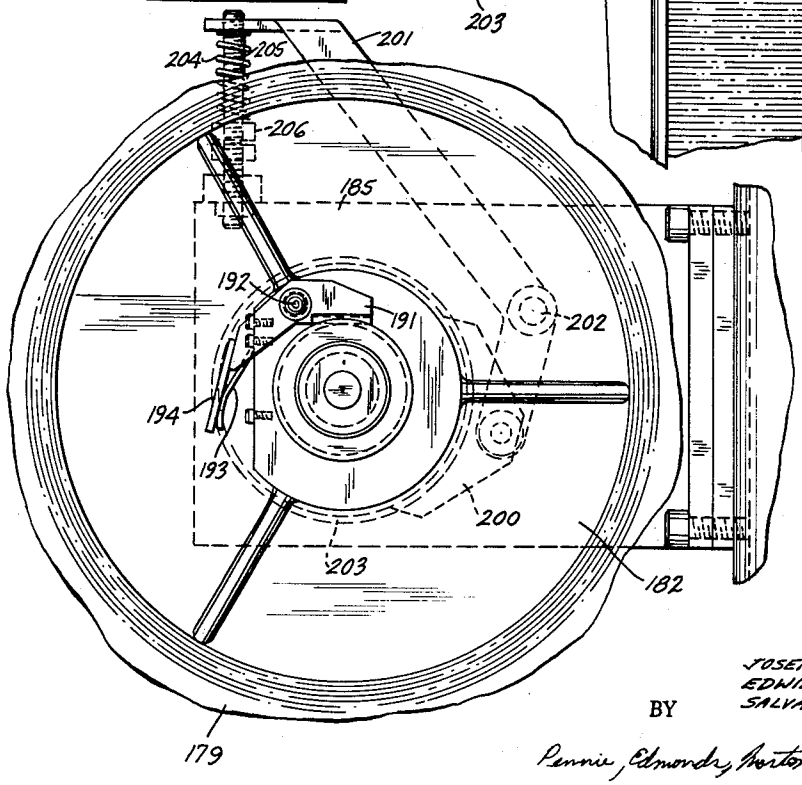


FIG. 25

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FIG. 26

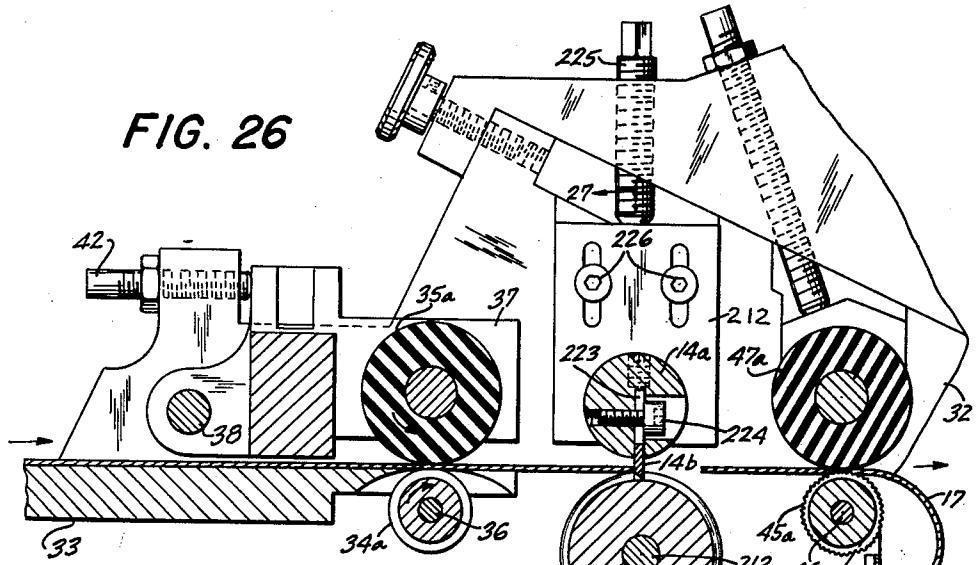


FIG. 28

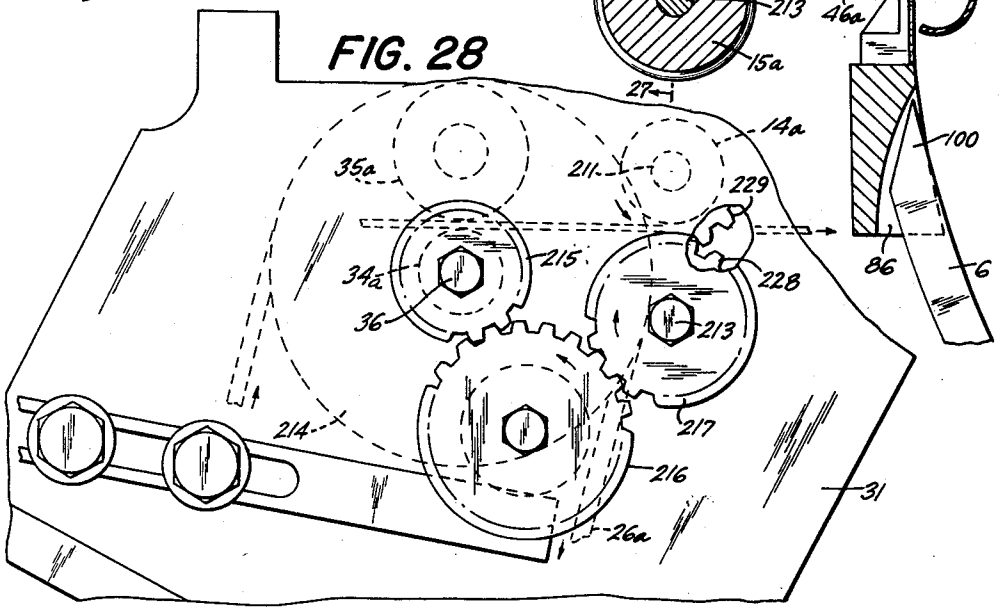
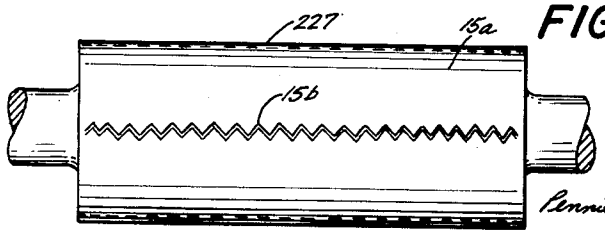


FIG. 30



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FIG. 27

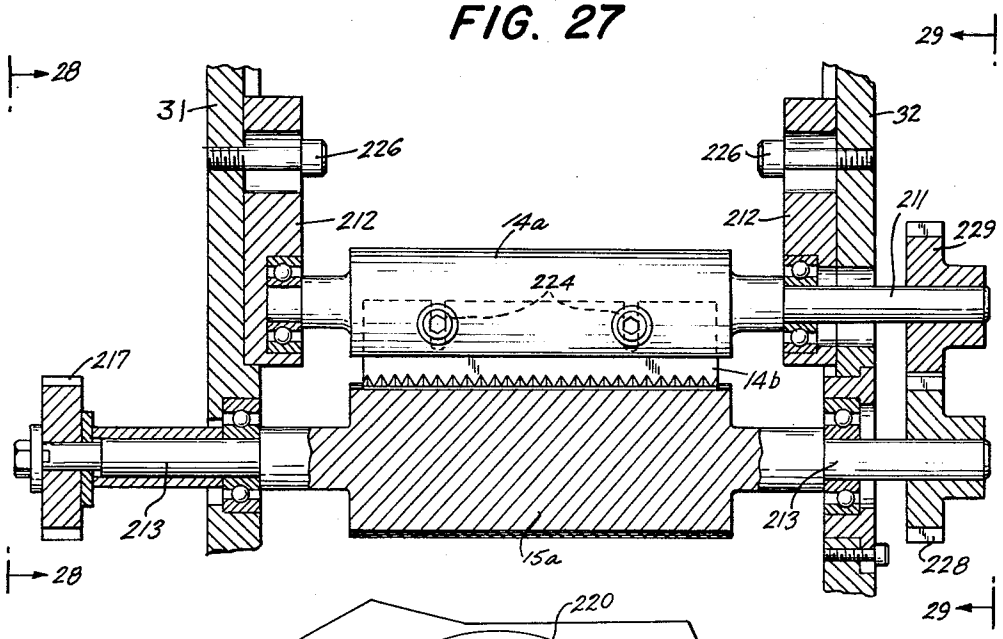


FIG. 29

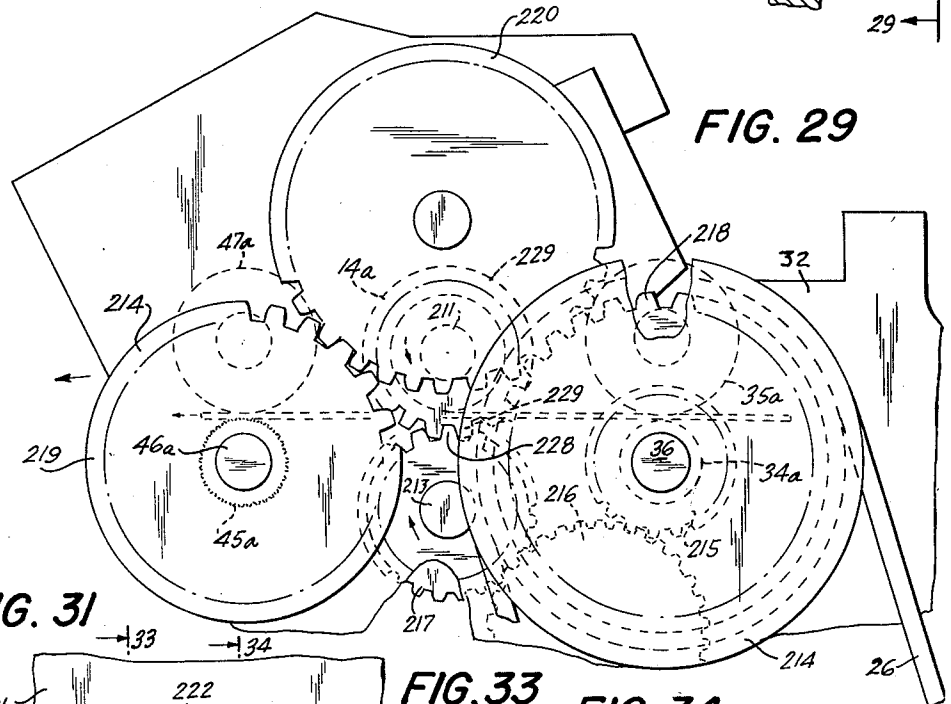


FIG. 31

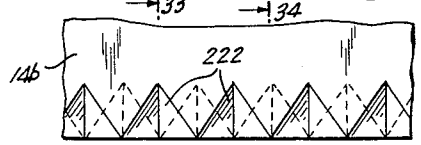


FIG. 32

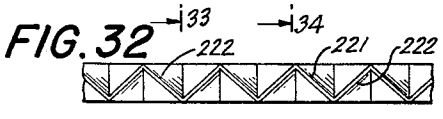


FIG. 33

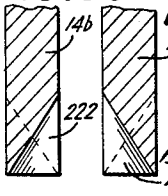


FIG. 34

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United States Patent Office

3,155,016

Patented Nov. 3, 1964

3,155,016

MACHINE FOR MAKING PAPER STICKS

Joseph S. Pellicone, Jericho, Edwin N. Dejewski, New York, and Salvatore Lo Piccolo, Jericho, N.Y., assignors to Chesebrough-Pond's Inc., Long Island City, N.Y., a corporation of New York

Filed Jan. 24, 1963, Ser. No. 253,650

29 Claims. (Cl. 93—1)

This invention relates to improvements in automatic machines of the rotary type for making paper sticks of varied diameters and lengths. Such sticks are used as confection sticks and for cotton-tipped swabs or applicators.

Most of these swabs have heretofore been made with sticks or stems of wood, and, as is well known, they have tips of soft fibrous material such as cotton secured to and projecting from one or both ends. A paper stick made by curling a section of paper sheet material of predetermined dimensions and rolling it to form a tight coil, and to compact it to a predetermined diameter, has certain advantages over the wood stick, such for example as flexibility and freedom from splintering.

The object of the present invention is to provide a machine for making paper sticks or stems of this sort and of various sizes for swabs and other articles these sticks being of uniform size and quality and being made automatically at a high rate of production. The invention also aims to provide a machine which is compact and occupies a minimum of floor space which is easy to adjust and requires little attention, so that one attendant can care for several machines.

The machine includes in accordance with the invention a generally circular channel of diminishing width from the intake end to the discharge end and into which successive curled sections of paper are fed, and along which they are rolled and compacted to form the paper sticks. The inner surface of such forming channel is constituted of the cylindrical face of a wheel or drum which rotates continuously at a uniform speed. The outer surface of the channel is formed by a series of rigid stationary sector members which are arranged around the circumference of the drum. The width of the wheel face and that of the sector members correspond with the length of the paper sticks to be produced.

These sector members, generally speaking, are arranged in end-to-end relationship so as to form with the cylindrical surface of the drum the circular stick-forming channel which is somewhat less in length than the complete circumference of the wheel. Independent supporting mechanism is provided for each of the sector members, advantageously three in number, so as to support the members in such a way as to cause the forming channel to be reduced in thickness from the intake end thereof to the vicinity of the discharge end.

Special feeding, severing and curling mechanism is provided for feeding a continuous web of paper to the severing mechanism which cuts the web into paper sections of uniform length. The feeding mechanism includes means for simultaneously feeding and crimping the successive strips or sections whereby these sections are curled, and their forward ends are successively introduced into the intake end of the circular forming channel.

The surfaces of the forming channel, that is, the surface of the rotating drum and the surface of the stationary sector members are provided with suitable friction material, advantageously abrasive material, so as to prevent slippage and cause the initially curled paper sections to be gripped and rolled into coils. These coils are then gradually reduced in size, the convolutions thereof being wound tighter and tighter as they move along the circular forming or reducing channel. Between the first and second sector members a moistening device is arranged, and moisture is applied to each paper roll as it moves across this device, this moisture serving to cause the starch in the paper to adhesively bind together the contiguous convolutions of the roll.

The mounting for the final sector member at the delivery end of the channel is advantageously made to form with the surface of the wheel throughout the final portion of its length, a channel which is of uniform thickness so that no further reduction in diameter of the paper sticks is brought about as they travel along this portion of the wheel, but repeated rotation of the sticks in this portion of the forming channel imparts uniform roundness to the sticks. Also the starch adhesive is permitted to partially set without the shifting of any convolution of paper upon its neighbors. The sticks are discharged onto a suitable endless conveyor which removes them from the apparatus.

A serrated knife is used to sever the web of paper into the paper sections so that the sections have a serrated edge at each end. The tongues of the serrations facilitate the adhering of the outer end of the paper section to the adjacent layer of paper. The rolling of the sticks while maintaining the diameter uniform compacts and solidifies the serrations with the contiguous layer so that any tendency for separation to take place is avoided. The invention also includes the feeding of the web of paper from the supply roll in a special manner which eliminates whipping and breakage of the paper web.

The invention will be described in connection with a machine for making paper sticks for cotton swabs as shown in the accompanying drawings.

In these drawings:

FIG. 1 is a view of the machine in side elevation;

FIG. 2 is a diagrammatic side elevation of the principal elements of the machine;

FIGS. 3–8 illustrate the paper feeding mechanism and are drawn to a larger scale than FIG. 1;

FIG. 3 shows this feeding mechanism in vertical section;

FIG. 4 shows the feeding mechanism in elevation and viewed from the same side as FIG. 1;

FIG. 5 is a transverse section taken on line 5—5 of FIG. 3;

FIG. 6 is a horizontal section taken on broken line 6—6 of FIG. 4 with the axes of the various rollers shown in the same horizontal plane;

FIG. 7 is a side elevation of the paper in-feed table or platform;

FIG. 8 is a plan view of the in-feed table;

FIG. 9 is a side elevation of the delivery conveyor for removing the completed paper sticks;

FIG. 10 is a plan view of the delivery conveyor;

FIG. 11 shows the gear drive for the delivery conveyor and is a view in elevation looking towards the farther side of FIG. 3;

FIG. 12 is a sectional view taken on broken line 12—12 of FIG. 11;

FIG. 13 shows the first or entry sector member, the water feed mechanism and a part of the second or reducing sector member in side elevation and drawn to a scale only slightly smaller than the scale of FIG. 3;

FIG. 14 (Sheet 9) is a vertical section taken on line 14—14 of FIG. 13;

FIG. 15 is a detailed vertical section taken on line 15—15 of FIG. 13;

FIG. 16 is a side elevation drawn to the same scale as FIG. 13 showing the reducing sector member and its supporting mechanism in side elevation;

FIG. 17 is a vertical section taken on broken line 17—17 of FIG. 16;

FIG. 18 is a view partly in vertical section and partly in elevation taken on line 18—18 of FIG. 14;

FIG. 19 is a side elevation of the third or pressure sector member and its mounting drawn to the same scale as FIGS. 13 and 16;

FIG. 20 is a plan view of the parts shown in FIG. 19;

FIG. 21 is a vertical section on line 21—21 of FIG. 19;

FIG. 22 is a detailed section on line 22—22 of FIG. 21;

FIG. 23 is a detailed section on line 23—23 of FIG. 21;

FIG. 24 is a view partly in plan and partly in central section showing part of the reel for the paper supply roll and its mounting on the base frame of the machine, also drawn to about the same scale as FIGS. 13, 16 and 19; and

FIG. 25 is a view in side elevation of the parts shown in FIG. 22 looking from the right of that figure;

FIG. 26 is a vertical section similar to FIG. 3 partly broken away showing feed mechanism with rotary instead of reciprocating cutting mechanism;

FIG. 27 is a transverse section taken on line 27—27 of FIG. 26;

FIG. 28 is a side elevation taken on line 28—28 of FIG. 27;

FIG. 29 is a side elevation taken on line 29—29 of FIG. 27;

FIG. 30 is an enlarged elevation of the platen roll showing the knife impression which serves as a die;

FIG. 31 is an enlarged partial elevation of the rotary knife or cutter;

FIG. 32 is a bottom view of the cutter; and

FIGS. 33 and 34 are sections taken on lines 33—33 and 34—34 of FIG. 31.

Referring now to these drawings and initially to FIGS. 1 and 2, the machine comprises a housing 1 mounted on a sub-frame or base 2, the whole advantageously being supported on a set of casters 3 so that it may be moved from one location to another.

The components of the apparatus comprise a paper feeding unit or mechanism indicated generally by reference numeral 4, and a paper stick making mechanism.

A general description of the stick making mechanism will be given first. It includes a main wheel or drum 5 and a series, in this case 3, of rigid sector members 6, 7 and 8. Located between the sectors 6 and 7 at the bottom of drum 5 there is a moistening device 9 (FIGS. 2 and 13) for supplying water or other suitable liquid to the paper coils. As indicated diagrammatically in FIG. 2, the three sector members 6, 7 and 8 are supported in spaced relation to the face of wheel 5 to form a generally circular stick-forming or reducing channel 10 which is thicker at its entrance end 11 than at its dischage end 12. The gap A adjacent entrance 11 is approximately ¾", and gap D at the discharge end is .100".

The machine shown and described herein is intended for the making of paper sticks which are 1/10" in diameter and 2⅞" in length. The paper from which the sticks are made is some .003" in thickness. The face of the main wheel or drum 5 and the widths of the three sector members, namely, entry sector member 6, reduction sector 7 and pressure sector 8, all have a width of 2⅞". Both

the wheel and the three sector members have surfaces of abrasive material which grip the paper effectively. The wheel 5 has narrow flanges 13 on each side, one of which is shown in FIG. 1, for the purpose of preventing sidewise shifting of the paper rolls in the channel 10. Flange 13 on the front is of transparent plastic so that the progress of stick formation can be observed.

Associated with the paper feed mechanism 4 is a severing mechanism consisting of a reciprocating knife blade 14 and stationary block 15 which sever from the web of paper 16 successive sections or strips 17, and there is also a curling mechanism which imparts a curl to each of these paper sections. This curl is engaged by the rotating surface of drum 5 and the stationary surface of the entry sector 6 (FIG. 2), and the relative rotation results in converting the successive curled strips 17 into coils 18.

As each of these coils is rolled forward between the gradually approaching surfaces of wheel 5 and the sectors 6, 7 and 8, the coils, which are loose at first, are rolled into tight coils and these coils are made tighter and tighter and smaller and smaller as they progress around wheel or drum 5. The coils are spaced from about 1½" to about 3" apart, depending on the speed of knife 14. As each coil 18 passes the moistening device 9 it receives moisture which is absorbed into the layers of paper and which activates the starch therein and causes the adjacent layers to adhere to one another. Reduction sector 7 is so mounted and adjusted as to bring about the principal reduction in diameter of the paper coils, and by the time they have reached the pressure sector 8 their diameter has about reached the final dimension.

Pressure sector 8 may be so adjusted that there is a somewhat further reduction in diameter as the paper rolls pass along the first part of this sector, but after the rolls traverse one-half to ⅔ of the length of this sector their size remains constant, pressure being applied by the concentric portion of this sector to insure roundness and smoothness, and to allow the adhesive to partially set before the sticks are delivered at the discharge end 12. At this point they are received on an endless conveyor and removed from the machine.

Returning to FIG. 1, wheel or drum 5 is mounted on shaft 19 which is carried in suitable bearings within housing 1 and projects forwardly to support the wheel outside of the housing. Wheel 5 is rotated at a constant speed by means of an electric motor 20 which drives the wheel through a reduction gearing 21 and endless belt 22. The electrical supply to motor 20 is through a main switch 23 and a start-and-stop button switch 24. The paper feed mechanism is driven by a separate motor 25 and endless belt 26. This motor is mounted upon a frame 27 which projects to the left of housing 1. Motor 25 is controlled by a second start-and-stop button switch 28.

The paper feeding and crimping unit 4 includes its own frame 29 (FIG. 3) which rests upon and is secured to an inclined member 30 that forms part of frame 27 of the machine. Frame 29 includes a front side plate 31 and a rear side plate 32. There is a platform or shelf 33 over which the paper web 16 is moved by a driven knurled feed roller 34 and a cooperating rubber faced idler roller 35. Platform 33 extends between the side plates 31 and 32. The shaft 36 of driven roller 34 rotates in bearings in side plates 31 and 32 (FIG. 6). Rubber faced roller 35, however, is mounted to rotate in bearings which are supported by bracket members 37 which can be raised to permit the insertion of paper web 16.

This bracket 37 is pivoted at 38 between upright extensions 39 which project from the respective side plates 31 and 32. Release levers 40 are pivoted at 41 on the opposite sides of bracket 37. When in horizontal position, these levers engage the inner ends of adjustable screws 42 and thereby clamp bracket 37 in the position shown in FIG. 3. By swinging the release levers 40 upwardly they are disengaged from the screws 42, and bracket 37 with

roller 35 can be raised so as to allow the paper web 16 to be placed in position over feed roller 34. Both the steel knurled feed roller 34 and its cooperating rubber faced idler roller 35 are grooved as shown in FIG. 6. The extension of platform 33 at the right of roller 34 in FIG. 3 is supported by a series of bridges which are received in these grooves. Such extension supports the web as it approaches the knives 14, 15.

The paper web 16 approaches platform 33 over an idler guide roll 43 at the outer end of the platform and then passes between a pair of side guides 44 which guide the opposite edges of the paper and direct the web to the feed rollers 34, 35. Guides 44 are adjustable as shown in FIG. 7 for the purpose of accommodating paper webs of different widths, the wider webs being used when it is desired to make the longer sizes of paper sticks.

Parallel with knurled feed roll 34 and spaced to the right of it, as shown in FIG. 3, is a steel crimper roll 45 mounted upon a shaft 46 which rotates in bearing openings in side plates 31 and 32. Directly above crimper roll 45 there is a cooperating rubber faced roller 47. Roller 47 rotates in bearings supported inside of the respective side plates 31 and 32. Adjusting screws such as the screw indicated at 48 in FIGS. 3 and 4 are provided for maintaining the desired fixed pressure between crimping roll 45 and roller 47 to bring about the crimping of the paper strips as they pass between these rolls after being severed by the knife 14.

The severing knife 14 and stationary block 15 are mounted midway between the feed rolls 34, 35 and the crimping roll combination 45, 47. Knife 14 is mounted on a vertically movable holder 49 to which the knife is adjustably secured by means of a series of screws 50. Knife holder 49 slides in guides 51 arranged at its opposite sides and secured to the respective side plates 31 and 32. A stabilizing roller 52 (FIG. 3) rotates on a stud 53 which projects rearwardly from the lower portion of knife holder 49. Roller 52 is disposed between the parallel surfaces 54 of a slot in a vertical member 55 which is secured near its upper and lower ends to the frame 29 of the feeding unit 4 by means of screws as shown in FIG. 3.

Knife holder 49 and knife 14 are reciprocated by means of a cam 56 having a cam slot 57 in its circular face which actuates a follower roller 58 mounted on the rear of the upper portion of knife holder 49. Cam 56 rotates on a stationary vertical shaft 59 which is secured at its lower and upper ends to the frame 29 and platform 33.

In order to drive the cam 56 and the paper web feeding and crimping mechanism a cross shaft 60 (FIG. 6) is continuously rotated by driving motor 25 through belt 26. Shaft 60 rotates in bearings mounted in apertures in the two side plates 31 and 32 which support the shaft just above the level of cam 56. A bevelled pinion 61 secured to shaft 60 meshes with the teeth of a bevelled gear 62 which is secured within a circular recess in cam 56 by means of screws as shown in FIG. 3.

At the end of shaft 60 which projects beyond side plate 31 a spur gear 63 is mounted. This gear meshes with an idler gear 64 which is mounted on the outer end of a short idler shaft 65 shown in FIG. 6. Idler gear 64 in turn meshes with a gear 66 mounted on the outer end of shaft 46 for the crimping roll 45. At the opposite end of shaft 46 and outside of side plate 32 there is a gear 67 which drives paper feed shaft 36 (roll 34) through an idler gear 68 and a gear 69 on this shaft.

Idler gear 68 also serves to drive the take-off or discharge conveyor as will now be described. This conveyor, which is of the endless type and indicated by reference numeral 70 in FIGS. 3, 9 and 10 forms a horizontal shelf which is parallel with above platform 33. The finished paper sticks are removed from the surface of drum 5 beyond the end of pressure sector 8 by a stripper plate 70*a*. Conveyor 70 is supported between a drive roll shaft 71 at its right end and idler roll shaft 72 at its left end. Drive shaft 71 rotates in bearings near its opposite ends which are supported in apertures in upward extensions 31*a* and 32*a* of the frame side plates 31 and 32. The idler shaft 72 rotates in bearings carried in side members 73 (FIG. 10) which are supported at their outer ends on struts 74. Side members 73 also serve as edge guides for the sides of conveyor 70.

Drive roll shaft 71 for the discharge conveyor 70 is rototed by a gear 75 fixed to its outer end beyond side plate extension 32*a*. This gear 75 is driven from idler gear 68 through a gear train shown in FIGS. 11 and 12 and consisting of gears 76, 77, pinion 78, gear 79 and pinion 80, which is mounted on a short shaft 81 on which idler gear 68 is mounted.

The crimper roll 45 and its shaft 46 are driven at a slightly higher speed than the feed roller 34 and its shaft 36. Severing knife 14 is provided with serrated or saw-tooth-shaped teeth 82 which are sloped with respect to the sides of the knife so that the tops of the teeth are sharply pointed. The serrated edge of knife blade 14 extends horizontally across the width of the paper feedway (FIG. 5) and thus the entire width of the web 16 is severed simultaneously.

The knife cam 56 rotates rapidly and reciprocates the knife several hundred times per minute; hence each cutting action is almost instantaneous. The rotation of the crimper roll 46 at a somewhat higher speed than the feed roll 34 maintains the paper taut during each severing action, and advances the strip 17 away from the knife and from the forward end of the web 16. There is an instantaneous retarding action by the tips of the knife 14 which tends to cause the pull of the crimping roll 45 to produce a slight tearing of the serrated tips. Knife 14 is located approximately half-way between the crimping roll 45 and feed roller 34. Since the cut is almost instantaneous all of the teeth contact and sever the paper at the same time across its width, producing a serrated edge at each end of the paper strip.

The three gears 63, 64, and 66 are replaceable with other sets of gears to either speed up or slow down the operation of the knife 14 and the feeding and crimping mechanism for the purpose of either shortening or lengthening the strips or sections 17, should it be desired to make either smaller or larger diameter paper sticks.

In order to insure that the successive strips 17 are each completely disengaged from the crimper roll 45 a set of stripper fingers 83 shown in front view in FIG. 14 and in side view in FIG. 3 are provided. These stripper fingers are mounted at the top of a stripper holder 84. They are narrow, blade-like members with pointed tips, these tips extending into circular grooves 85 (FIG. 6) in crimper roll 45, the tips of the strippers being disposed slightly below the surface of the crimper roll. The lower portion of stripper holder 84 has a series of equally spaced vertical fingers 86 to cooperate with the upper end of the entry sector member 6, as will be described.

Attention is now directed to FIGS. 13–18 which show the arrangement of entry sector member 6, reducing sector member 7 and the water feed device 9.

These sector members 6 and 7 are supported on the opposite sides of a vertically adjustable bracket support 87 which is of generally rectangular shape in front view as shown in FIG. 13. Bracket support 87 consists of a vertical rear plate 88 and two parallel plates 88*a* and 88*b* which are welded thereto and project forwardly therefrom. Back plate 88 is mounted by means of a pair of screws 89 on the face of a rectangular steel pad 90 which is fixed to the front surface of housing 1 (FIG. 14) by welding or otherwise. Bracket support 87 can be vertically adjusted by means of a screw 91, and a lock nut, to properly set the positions of sector members 6 and 7 as will be described.

Screws 89 pass through vertical slots in the back plate 88 in order to permit this adjustment, and which are tightened after the adjustment is made. The entry sector

member 6 is supported on back plate 88 of bracket support 87 by means of a pivot pin 92. This pin has a reduced rear portion (FIG. 14) which has a force fit in a hole in back plate 88.

It is important for the lower or right-hand end of entry sector 6 to be positioned on the center line of pivot pin 92 in order properly to transfer the paper coils or rolls 18 to the surface of the moistening device 9. Accordingly, sector member 6 is supported on pin 92 by means of a mounting plate 93 which is spaced some distance to the rear of this sector member.

This mounting plate 93 is generally rectangular, as shown in FIG. 13, and is provided with an extension or ear 94 which is apertured to receive pivot pin 92. Sector member 6 has stiffening ribs 95 along its exterior edges, and mounting plate 93 is secured to the side of the rear stiffening rib, as shown in FIG. 13 and at the right in FIG. 14, by a screw 96 and two dowel pins, a spacing block 97 being inserted between plate 93 and the side of such stiffening rib 95.

The sector member 6 is secured in proper angular position by means of a screw and washer arrangement 98 (FIG. 13). The screw passes through a vertical slot in mounting plate 93 and is threaded into an aperture in housing 1. For the purpose of adjusting the angular position of sector member 6 an adjusting screw 99 with lock nut is arranged to engage the lower edge of mounting plate 93.

The upper or entrance end of entry sector member 6 is provided with a series of equally spaced fingers 100 which interengage fingers 86 of stripper holder 84. By means of adjusting screw 99 the surfaces of fingers 100 can be made to merge with the right hand surfaces of fingers 86, and at the same time adjust the width of gap A between the surface of rotating drum 5 and the surface of entry sector member 6.

The moistening or water supply device 9 is mounted on bracket support 87 and includes a water receptacle 101 which rests on shoulders 102 on the inside surfaces of the two vertical plates 88*a* and 88*b* of bracket support 87. Water receptacle 101 is removably clamped in position by means of a holding screw 103. Within receptacle 101 there are shoulders 104 upon which a grid 105 rests composed of sets of crossed wires the purpose of which is to support a porous moistening device 106, conveniently in the form of a sponge. The upper surface of this sponge is curved as shown at 107 to conform with the curvature of wheel 5. This moistening device spans the distance between the lower ends of the entry sector member 6 and the reducing sector member 7.

Water is supplied to the water chamber 108 within receptacle 101 from a water reservoir 109 which is connected to receptacle 101 through a piping system shown at 110. The supply of water from reservoir 109 is controlled by means of a manually operated needle valve 111. An outflow piping system is shown at 112 which is connected to the bottom of receptacle 101 and which is provided with angularly adjustable overflow pipe 113. By raising or lowering the outer end of pipe 113 the level of the body of water within space 108 can be regulated.

The level of the water is maintained above the bottom of porous device 106 so that water may be absorbed by this device and fed upwardly by capillarity to be applied to the paper coils as they move over the curved surface 107. A sight glass 114 (FIG. 14) enables the water level to be visually inspected.

Although the water level is controlled by the angular position of overflow pipe 113, the feed of the water drop by drop is regulated by the needle valve 111 in accordance with the requirements of the machine so that the overflow is reduced to a minimum. Although a single sponge is shown, the moistening device 106 may be made of a number of layers of sponge or of any other suitable porous material.

When it is desired, for example, in order to clean the machine, the entire water supply unit 9, including receptacle 101, the water supply system and the water overflow system may be removed as a unit by loosening screws 103. This can be done without disturbing the adjustment of the height of the sponge surface 107 or the water level setting. Also, the device 106 and grid 105 are removable for replacement when required.

Referring to FIG. 16 the reducing sector 7 is provided with a pair of stiffening rib-like plates 115 on the back or outside surface thereof. The sector is supported on the right hand side of bracket support 87 by means of a pivot pin 116 which passes through plates 115 (FIG. 17) and aligned apertures in a pair of small brackets 117. These are welded, or otherwise secured, to the right hand or outside surface of vertical plate 88*b*.

The upper edge of plate 88*b* is flush with the surface of the moistening device 106 and has short spaced ears 118 which are intermeshed with a series of fingers 119 on the lower end of reducing sector 7 so as to form a continuous surface for the passage of the paper rolls. At its upper end reducing sector 7 is also provided with a series of fingers 120 which interengage with somewhat similar fingers 121 on the lower end of pressure sector member 8.

For quick retraction from wheel 5 and quick return, reduction sector member 7 can be swung outwardly and downwardly away from the surface of drum 5 about its pivot 116 by means of the mechanism shown at the right of FIG. 16 and also in FIG. 18. This includes a toggle lever 122 having a handle 123, and pivoted at 124 to a bracket 125 which extends forwardly from the face of housing 1.

Pivoted to toggle lever 122 at 122*a* is an adjustable link 126 which is pivoted at its upper end to the upper end portions of pressure sector 7 at 127. Link 126 includes a compression spring 128 the compression of which is adjustable by the lock nuts 129. The compression of this spring enables the pivot 122*a* to be carried to the left beyond the pivot center line to produce the locking of the toggle, with the lower side of link 126 engaging the side of lever 122.

The compression of spring 128 also enables the pressure sector 7 to be adjusted in its relation to the surface of wheel 5. This adjustment is produced by means of a screw 130 which is threaded into an aperture in a cross plate between the upper ends of ribs 115. The upper end of the screw engages a fixed stop 131 which projects downwardly from a bracket 132 secured to the housing 1.

The gap B between the lower ends of both the entry sector 6 and the pressure sector 7 is adjusted by means of screw 91 shown in FIG. 13. This raises or lowers bracket support 87 as previously referred to. Gap B is set at about 3/8". The gap C at the upper end of sector 7 is adjusted by means of the screw 130 which causes toggle 122 to stop the upper end of sector 7 at different elevations. This gap is set at something like 1/8" as the paper rolls are further reduced by the pressure sector 8, as will be seen.

FIGURES 19–23 show the mounting for pressure sector 8. Because the total pressure of the considerable number of paper rolls 18 which are moving forward beneath this sector is considerable, the sector has a stiffening support 133. This includes a semi-circular flange portion 134 and a wide outer rib member 135 which is located at the center of flange 134. The sector is secured to flange 134 by screws 136.

The working surface of pressure sector 8 has two curvatures. The entry portion 137 which extends for about two-thirds of the length of the sector has a curvature which is greater than that of the surface of drum 5, whereas the remaining approximately one-third of the working surface which is indicated by numeral 138 has a curvature which is approximately the same as that of wheel 5.

As the paper rolls 18 reach the junction point of these two sections 137, 138 they have been compacted or compressed to their final diameter of 1/10", or in other words, the paper sticks are completely formed. Thereafter the spacing of the face of wheel or drum 5 and the surface of section 138 of pressure sector 8 remains constant, that is, these surfaces are concentric.

Three adjustments of pressure sector 8 are provided. The first adjustment is the shifting of the pressure sector with respect to the wheel while maintaining these surfaces in concentric relation. This adjustment controls the size of the finished paper stick. The second adjustment is for quick retraction of the entire pressure sector 8 away from the wheel for purposes of inspection, and the quick return of the sector without changing previous adjustments. The third adjustment is a tilting adjustment for the purpose of bringing the surfaces of the wheel and sector into concentric relation throughout pressure section 138.

The supporting mechanism shown in FIGS. 19–23 is constructed to enable these three adjustments to be made, and also to firmly and rigidly support pressure sector 8 in its operative position. This supporting mechanism comprises three contiguously mounted heavy steel plate members as shown in section in FIG. 21. These comprise a bracket 139 to which pressure sector 8 is secured, this bracket being supported by a slide member 140, the central plate, on which it is vertically adjustable as will be described, and an angularly adjustable base member 141, this base being secured to a steel pad 142 which is mounted on the outside surface of housing 1.

In order to support the pressure sector 8, bracket 139 has a horizontal flange 143 welded thereto along its bottom edge (FIG. 21). This flange is also welded to the lower ends of two vertical rib-like members 144 which project in parallel relation from the front of bracket 139. Flange 143 is secured to a plate 145 on the top of stiffening support 133 for sector member 8. Plate 145 is welded to rib 135 of this support. Flange 143 and plate 145 are secured together by four screws 146.

Bracket 139 is mounted for vertical adjustment on the front surface of its supporting slide 140. Four screws 147 pass through vertical slots in bracket 139 and have threaded engagement in apertures in slide 140 (FIGS. 19 and 21). These four screws are loosened when it is desired to make an adjustment, and then retightened. The adjustment is made by means of an adjusting screw 148 and two stabilizing screws 149.

In the front of bracket 139 there is an elongated opening 150 shown in FIGS. 19 and 21, and the lower end of adjusting screw 148 extends into this opening, the screw being threaded in an aperture in the upper portion of bracket 139. The lower end of adjusting screw 148 engages a block 151 within opening 150 and which is mounted in fixed position on the front surface of slide 140 by means of two screws 152.

Consequently, by turning screw 148 after the clamping screws 147 have been loosened and screws 149 backed off, if necessary, the position of bracket 139 on slide 140 can be adjusted vertically. After such adjustment is made stabilizing screws 149 are adjusted to bring their lower ends into engagement with the upper surface of bracket 139 as shown in FIG. 19. Screws 149 are received in threaded apertures in a bar 153 which is welded or otherwise secured to the front surface of slide 140 along its upper edge.

The above describes the mechanism which provides the first adjustment heretofore mentioned, namely, the shifting of sector 8 in concentric relation to the wheel 5.

The second adjustment for quick retraction of the sector for inspection purposes, and its quick return, is accomplished as follows:

Bracket 139 and slide 140 being secured one against the other by the four screws 147 are adjusted together by sliding movement of slide 140 beneath a pair of L-shaped

gib members 154 (FIG. 20). These gibs are secured by means of screws 155 (FIG. 19) to the base 141. The lip portions of gibs 154 extend into contact with the side margins of slide 140, bracket 139 being narrower than the slide as shown in FIG. 19.

The quick retraction and quick return vertical movement of sector 8 is accomplished by turning a throw pin 157 which has an eccentric 158. This eccentric turns in a slotted aperture 159 in slide 140 (FIG. 22). The rear circular end portion of throw pin 157 turns in a circular aperture 160 in base 141. Forward of the eccentric 158 the throw pin has a second circular section 161 the sides of which engage the sides of aperture 150 in bracket 139. At its forward end the throw pin is slabbed as shown at 162 to receive a special wrench 163 (FIG. 1) having a square opening.

It will be understood that by rotating throw pin 157 with its eccentric 158 in the counterclockwise direction, as shown in FIG. 19, the slide 140 and the bracket 139 mounted thereon will be raised upwardly and the sector 8 will be lifted a distance away from the surface of wheel 5. With a 180° rotation of throw pin 157 the sector will be raised approximately 2" above the wheel. This is ample for inspection and cleaning of the abrasive surfaces of both the wheel 5 and sector 8 and for any other purpose for which inspection might become necessary.

Upon rotating the pin 157 and eccentric 158 in the opposite or clockwise direction, the bracket 139 and slide 140 will be lowered back to their original positions. At this point the lower ends of two screws 173 engage the upper surface of the base 141. Screws 173 are threaded into apertures in a horizontal bar 174 which is fixed by welding or otherwise across the upper end of the slide 140 at the rear (FIG. 21).

Throw pin 157 has a projection 175 secured to it in line with the center of eccentric 158. A screw 176 is positioned in a threaded aperture in the left hand rib 144 which projects from the bracket 139. The screws 173 are so adjusted that they are brought firmly against the top of slide 140 as the eccentric moves slide 140 to its lowermost position. By swinging projection 175 somewhat past the dead center position as shown in FIG. 19 it will engage the right end of screw 176 and the parts will be held firmly in adjusted position by such toggle lock action.

The third or tilting adjustment, to bring the surfaces of the wheel 5 and sector 8 into concentric relation throughout the pressure section 138 of the sector is accomplished by tilting base 141 on pad 142. The base is secured to this pad by means of two bolts 164 and 165 and two screws 167. Bolts 164 and 165 are visible in FIG. 19 through two access holes 167 in rib 135.

In order to permit the adjustment, bolts 164 and 165 and the two screws 166 are first loosened, and then the tilting adjustment is accomplished about bolt 164 by means of two long cylindrical adjusting screws 168 and 169. These horizontal screws are threaded in apertures extending from the opposite side surfaces of base 141 to a central opening 170 (FIG. 23), the inner ends of the screws engaging the opposite sides of a block 171. This block is fixed to the steel pad 142 by means of two screws 172. The block is sufficiently smaller than the opening 170 to permit the tilting adjustment of base 141. By turning the two scerws 168 and 169 the desired tilting movement about bolt 164 can be accomplished. When this is done screws 164 and 165 and screws 166 are retightened.

It has been mentioned that the surfaces of drum or wheel 5 and of the three sector members 6, 7 and 8 are of abrasive material. While sand paper has been found adequate for use on the surfaces of the entry sector member 6 and the reducing sector 7, the drum 5 is advantageously a stone wheel, or a wheel having a rim of stone. A grind stone wheel gives excellent service and its surface is easy to clean. The surface of pressure sector 8 is also ad-

vantageously made of stone similar to the stone used for wheel 5, although an abrasive surface of sprayed metal may be used, if desired.

An abrasive surface 178, made conveniently of sand paper, is also arranged just below the stripper fingers 83 (FIGS. 3 and 13) where the forward edge or end of the crimped section or strip of paper 17 first contacts the outer surface of the stick forming channel 10. This sand paper surface 178 extends between the lower edges of stripper fingers 83 and the upper edge of finger holder 84 containing fingers 86 which are intermeshed with the fingers 100 at the upper or entrance end of the entry sector 6.

Referring now to FIGS. 2 and 24 the web 16 is a continuous strip of paper from a supply roll 179 which is carried upon a reel 180 shown in detail in FIGS. 1, 24 and 25. This reel comprises an inner or rear flange 181, and an outer flange 182, which support the roll 179 between them.

These two flanges are carried on a sleeve shaft 183 which is received upon the outer end of an overhanging shaft or arbor 184 which is supported for rotation in ball bearings as indicated mounted on a bracket 185 secured by screws or bolts 186 to the left hand side of base 2 as shown in FIG. 24. Inner flange 181 is secured to sleeve 183 by means of a set screw 187 so that this flange may be adjusted in position when it is desired to use a paper roll of greater width than roll 179. Shaft 184 is caused to rotate with sleeve 183 by means of a pin 188 which is fixed to the sleeve and projects inwardly into a slot 189 extending lengthwise of shaft 184.

In order to facilitate the replacement of an exhausted roll the outer flange 182 is removably mounted on the outer end of sleeve 183 by mechanism which permits the quick removal of the flange and its quick replacement and adjustment with respect to the new roll of paper. For this purpose the outer end of sleeve 183 is provided with a coarse thread 190 which is engaged by the inner edge of a blade-like member 191. This member is pivoted at 192 to the front face of flange 182 and is biased into engagement with the threads 190 by means of a spring 193 which bears against a handle member 194.

The flange 182 is removed by pressing handle 194 so as to disengage blade 191 from threads 190 which frees the flange so that it can slide off from the outer end of sleeve 183. When a new roll of paper has been placed in position the flange 182 is replaced and an approximate adjustment of its position with respect to the side of the new roll is obtained by reengaging blade 191 with threads 190. A closer adjustment of the position of flange 182 is obtained by rotating the flange, blade 191 following the threads 190.

It is important to have the roll of paper 179 rather precisely in alignment with the feeding unit 4 and specifically with the side guides 44 of in-feed platform 33. For this reason the reel mechanism above described is mounted on sleeve 183 instead of on shaft 184, and sleeve 183 may be adjusted longitudinally of this shaft, which being mounted in ball bearings as indicated, is non-shiftable lengthwise. This adjustment is accomplished by an adjusting screw 195 which is threaded into an aperture in the end of shaft 184. Screw 195 is arranged so that it may be readily turned manually with respect to sleeve 183, but the axial movement thus produced is transmitted to the sleeve.

A bushing 196 having a flange which fits closely within the outer end of sleeve 183 is welded in this position. On each side of bushing 196 are two collars 197 and 198, each being positioned close to the opposite ends of the bushing and pinned to the outer portion of screw 195. The screw may be turned by means of the outer collar 198, and secured in adjusted position by means of a lock nut 199. The screw has a loose fit in bushing 196 to prevent binding.

In feeding the web of paper from supply roll 179 to the feeding mechanism of feed unit 4, it is desirable to apply a certain amount of drag to facilitate the operation of the feed mechanism, the crimping mechanism and the cut-off mechanism, and also to prevent rotation of the roll by its inertia when the feed is stopped suddenly. This is provided by means of a brake shoe 200 shown in dotted lines in FIG. 25. This brake shoe is pivotally mounted on the lower end of an actuating arm 201 which has a fixed pivot 202 on bracket structure 185.

Brake shoe 200 operates against the surface of a flanged brake drum 203, and is urged against this surface by means of a compression coil spring 204. This spring bears against a horizontally turned extension of arm 201 and is held in position by means of a threaded rod 205. Rod 205 is secured to the upper surface of bracket support 185. The lower end of spring 204 rests upon a pair of adjusting nuts 206 by which the amount of drag can be adjusted. It will be understood that other types of brake mechanism may be used if desired.

The special manner in which the web 16 is fed from roll 179 to the stick making apparatus is illustrated in FIG. 2. If the paper web is fed either directly from the supply roll to the feed mechanism 34, 35, or is fed over one or more idler rollers to this mechanism, breakage of the tape because of whipping and the inertia of the supply roll and reel is apt to occur, particularly in starting the apparatus in operation when a new full roll is installed on the reel 180. A full supply roll is some 18" to 24" in diameter so that it possesses considerable inertia.

In accordance with this feature of the invention the paper web 16 as it leaves the surface of the supply roll 179 is directed to the right over an idler roll 207 which is arranged to rotate on a horizontal axis beneath the stick making mechanism. The web then passes downwardly over a second similar idler roll 208 and thence into contact with the surface of supply roll 179 which redirects the paper web upwardly onto the idler roll 43 at the left hand of in-feed platform 33.

The arrangement is such that the web engages supply roll 179 throughout an angular distance of approximately 90°. Also, idler rolls 207 and 208 are so positioned that the movement of the paper web as it contacts the surface of the supply roll is in the same direction as the movement of the supply roll surface. The distance from the take-off point 209 where the paper web 16 leaves the surface of the supply roll 179 to the point 210 where it engages the surface of the supply roll after passing over idlers 207 and 208 is several feet.

The supply roll 179 is rotated by tension applied to the paper web 16 by the feed rollers 34, 35. This tension is applied in two ways to rotate the supply roll, first by frictional contact of the web with the surface of the supply roll commencing at point 210, and second by pull of the web at the take-off point 209. By turning the supply roll in this manner, when the roll is of large diameter and the intertia therefore considerable, the turning force is applied at a long radius from the center of the roll, but as the inertia of the roll becomes less as the roll is consumed, the radius is proportionately decreased.

This simple arrangement of the path of the tape from the take-off point 209 over the idler rollers 207 and 208 and thence into frictional engagement with the supply roll has been found to greatly reduce whipping and breakage of the paper tape, especially when starting a new roll. It takes the place of extremely complicated and costly mechanism which would otherwise be required for controlling the tape feed.

Because the paper tape is being pulled forward by the feeding rollers 34, 35, should a roll have an excessive amount of drag from the brake mechanism, or otherwise, the paper web will tighten, imparting a greater grip on the paper roll and overcoming the excessive drag. Conversely, should the paper roll 179 turn too freely, the

engagement of the paper web with the paper roll will lessen and not impart so great a turning force to the roll. This action is greatest when the paper roll is large, and least when the roll is small, being in this manner self-compensating.

The improved method of feeding the paper web and turning the supply roll is helpful at high speeds of the paper feed. By the absence of excess whipping or excess turning effort on the paper roll, the control of the paper is accomplished entirely by the paper feed rolls 34, 35. The pull of this feeding mechanism is constant so that the paper is under better control for uniform cut-off of the blank lengths 17.

FIGS. 26–29 illustrate a modification of the severing mechanism wherein the strips 17 are cut off from the web 16 by means of a rotary, instead of a reciprocating device. These figures should be examined in connection with FIGS. 3, 4 and 6.

The feeding mechanism comprising knurled roller 34*a* (FIG. 26) and rubber faced idler or pressure roller 35*a* are the same as the corresponding parts shown in FIG. 3. This is true also of the crimping mechanism comprising the steel crimping roll 45*a* and the cooperating rubber faced pressure roll 47*a*. However, the feeding and crimping mechanisms are spaced farther apart than in FIG. 3 in order to accommodate the rotary severing mechanism.

This severing mechanism comprises a rotating cylinder 14*a* carrying a punch member 14*b*, and a cooperating cylinder 15*a* on the surface of which is fixed a die member 15*b* which coacts with the rotary punch member 14*b*. These two cylinders are geared to rotate in unison and are positively driven in timed relation with the feeding and crimping mechanisms, as will be described.

The shaft 211 for punch carrying cylinder 14*a* is carried in bearings in vertically adjustable supports 212 (FIG. 27) and extends to the rear side of the machine, which is to the right of rear frame plate 32, the front side of the machine being that shown in elevation in FIG. 1. Cylinder 15*a* carrying die 15*b* is secured to a shaft 213 which rotates in bearings supported by front and rear frame plates 31 and 32.

The drive for feeding mechanism 34*a*, 35*a*, severing mechanism 14*a*, 15*a*, and crimping mechanism 45*a*, 47*a* is by means of an endless belt 26*a* from motor 25 (FIG. 1). This belt is on the rear of the machine as before, but drives a pulley 214 which is secured to shaft 36 instead of to shaft 60 as in the severing mechanism previously described. Thus, the feeding mechanism, roller 34*a* of which is mounted on shaft 36, is driven directly by the endless belt 26*a*. The pressure roller 35*a* which cooperates with roller 34*a* is frictionally driven.

In the modified mechanism of FIGS. 26–29 shaft 36, instead of terminating at its front bearing as shown in full lines in FIG. 6, extends forwardly from front plate 31 and has a gear 215 secured thereto at its front end, as shown in dot-and-dash lines in FIG. 6 and also shown in FIG. 28. Gear 215, through an idler gear 216, drives gear 217 on shaft 213 of the die cylinder 15*a*. Idler gear 216 rotates on a stub shaft supported on frame plate 31. As previously described, rolls or cylinders 14*a* and 15*a* rotate in unison and the drive is from the latter to the former by means of two gears 228 and 229 of the same diameter and secured respectively to the rear ends of shafts 213 and 211.

The drive of the crimping mechanism 45*a*, 47*a* is by means of gears mounted on the rear of the machine as shown in FIG. 29. For this purpose a gear 218 mounted on the rear end of shaft 36 drives a gear 219 through an idler gear 220. Gear 219 is secured to shaft 46*a* for the crimper roller 45*a*. Pressure roll 47*a* of the crimping mechanism is rotated by frictional engagement with the roller 45*a*.

The gear ratios are such that the crimping mechanism 45*a*, 47*a* rotates at slightly higher speed than the feeding mechanism 34*a*, 45*a* thereby, as before, placing the paper section or strip 17 under slight tension as it is severed by the cooperation of the rotating punch member 14*b* and the die roll 15*a*.

When it is desired to change the length of the paper strips or sections 17 the three gears shown in FIG. 28, namely, gears 215, 216 and 217, may be removed and gears having different numbers of teeth substituted therefor. Also, gears 218, 219 and 220 of FIG. 29 may be somewhat similarly replaced.

The punch member 14*b* is shown in fragmentary view but drawn to an enlarged scale in FIGS. 31–34. It consists of a steel plate or bar of some thickness, for example of the order of 1/16". It is mounted in a radial slot 223 in roll or cylinder 14*a* and is secured in position lengthwise of the cylinder by means of screws 224 which pass through slots cut in the inner edge of the plate-like or bar-shaped punch member. The bar has a punching face 221 extending along its projecting edge in zigzag formation extending from side to side of the bar or plate, as shown in FIG. 32. The punching face or surface 221 is formed by equally spaced V-shaped cuts 222 made alternately from the opposite sides of member 14*b* and at an angle of from about 25° to about 60° to the surface of the member. In this way the zigzag punching face 221 may be made continuous throughout the length of the punch member. If desired, however, this continuous surface may be interrupted at its peaks at the intersections thereof with the opposite surfaces of the punch member.

The cylinder or roll 14*a* may be adjusted with respect to the surface of die cylinder 15*a* by shifting the position of the mounting supports 212, adjusting screws 225 being provided for each of these blocks. After the proper adjustment has been made the blocks are each secured by means of a pair of screws 226, these screws passing through vertical slots in supports 212.

The die 15*b* is formed in the surface of a layer 227 of fibrous material which is much softer than the punch, such as heavy paper, for example kraft paper, which may be secured to the surface of cylinder 15*a* in any desired manner, as by means of adhesive. In order to form die 15*b* the punch roll 14*a* is progressively lowered by shifting blocks 212 as the machine is operated until the punching portion 221 of punch member 14*b* is duplicated in the surface of the paper layer 227. After such impression has been made the apparatus is ready for operation in the making of paper sticks. At each revolution of the punch roll 14*a* the zigzag punch 221 will be impressed through the paper web 16 into the die formation 15*b*, thereby producing a serrated cut.

As mentioned above, the slightly increased speed of the crimping mechanism 45*a*, 47*a* places the portion of the web between the crimping members and the punch and die members under a slight tension as the punch and die members produce their severing action. Then the strip 17 is fed forward and delivered to the rolling mechanism previously described.

We claim:

1. In a machine for forming paper sticks by tightly rolling and compacting sections of paper web, a drum arranged to rotate continuously on a fixed horizontal axis, a series of rigid and unyielding sector members disposed around the periphery of the drum but extending less than the full circumference thereof, the width of the sector members being approximately the same as the drum face, means for supporting each of the sector members in fixed but independently adjustable position spaced from the face of the drum, the intake end of the series being spaced farther from the drum than the delivery end of the series and providing a reducing channel which has a gradually smaller thickness from one end to the other regardless of the diameter of paper stick which the machine is to produce, means for feeding successive sections of paper of uniform length and partially curled to the intake end of the series of sector members, and means for

removing rolled and compacted paper sticks from the delivery end thereof.

2. A machine for forming paper sticks as set forth in claim 1 wherein the surfaces of the drum and of the sector members are formed of abrasive material.

3. A machine for forming paper sticks as set forth in claim 1 wherein the surface of the drum is composed of stone.

4. A machine for forming paper sticks as set forth in claim 1 wherein the final sector member of the series has two curvatures, the first portion thereof being eccentric with respect to the surface of the drum, and the remaining portion being concentric therewith.

5. In a machine for forming paper sticks by tightly rolling and compacting sections of paper web, a drum arranged to rotate continuously on a fixed horizontal axis, a supporting frame therefor, an entry sector member, a reducing sector member and a pressure sector member arranged in end-to-end relationship and supported on said frame to partially surround the drum and form therewith a stick rolling and reducing channel of diminishing thickness from the in-feed end of the entry sector to the vicinity of the discharge end of the pressure sector, the reducing channel portion of each sector member extending through an arc of less than 90°, web feeding, severing and crimping mechanism for delivering successive sections of paper of uniform length and partially curled to the in-feed end of the entry member, and means for independently adjusting each of said sector members with respect to the surface of the drum.

6. A machine for forming paper sticks as set forth in claim 5 wherein a bracket support is mounted for vertical adjustment on said frame, the lower ends of the entry sector and the reducing sector members being pivoted to this bracket support, and means for quick retraction and return of the reducing sector member with respect to the drum, said means being connected respectively to the upper end portion of the reducing sector member and to said frame and causing the sector to swing outwardly about its pivot.

7. A machine for forming paper sticks as set forth in claim 6 wherein the adjusting means comprises a toggle lever mechanism pivotally connected at one end to the upper portion of the reducing sector member and at its lower end to said frame.

8. A machine for paper sticks as set forth in claim 7 wherein the connection between the upper end of the toggle mechanism and the sector member includes a compression spring, the upward movement of the sector member being arrested by an adjustable fixed stop so as to regulate the gap between the upper end portion of the reducing sector member and the drum.

9. A machine for forming paper sticks as set forth in claim 5 having additionally a bracket support mounted for vertical adjustment on said frame, the entry sector and reducing sectors being pivoted at their respective lower ends on the bracket support, and adjusting means associated with the entry sector member for rocking the member on its pivot to adjust the gap at the beginning of the entry member with respect to the surface of the drum, the gap between the lower ends of the two sector members and the drum being adjusted by the vertical adjustment of the bracket support.

10. A machine for forming paper sticks as set forth in claim 9 wherein a moistening device is mounted on the bracket support, and the entry and reducing sector members are pivoted on the bracket support at the opposite sides of the moistening device.

11. A machine for forming paper sticks as set forth in claim 9 having additionally, means for removably mounting a moistening device on the bracket support, such device including a porous element having a surface in line with the adjacent sector members for moistening the paper coils as they roll over it, a liquid reservoir beneath said element, means for supplying liquid to the reservoir and an adjustable overflow member for regulating the height of the liquid in the reservoir.

12. In a machine for forming paper sticks as set forth in claim 5 wherein the means for adjusting the position of the pressure sector member includes means for moving this sector member in concentric relation to the surface of the drum, means for moving the sector member in eccentric relation to the surface of the drum, and means for quick retraction of the sector member away from the drum surface and quick return thereto to adjusted position.

13. A machine for forming paper sticks as set forth in claim 5 wherein the adjusting mechanism for the pressure sector comprises three flat rigid plate members mounted in contact with one another, the outer plate member being connected to the sector member to support the same, means for vertically adjusting the outer plate member with respect to the central plate member, mechanism for quickly retracting the sector member from the drum by vertical movement of the outer plate member on the surface of the central plate member, and for quickly returning the outer plate member and the sector carried thereby to their originally adjusted positions, the rear plate member being mounted on said supporting frame and including means for angularly adjusting the plate member with respect thereto.

14. A machine for forming paper sticks as set forth in claim 5 wherein the reducing sector member and the pressure sector member have interengaging fingers for permitting the adjustment of each of these members independently of the other with respect to the surface of the drum, and at the same time enabling a smooth passage of the paper rolls from the reducing sector to the pressure sector member.

15. A machine for forming paper sticks by tightly rolling and compacting sections of paper web as set forth in claim 5 wherein the crimping mechanism includes a crimping roll having lengthwise spaced grooves therein, a series of stripping fingers being disposed within these grooves for removing the curled paper sections therefrom, and a member supporting said fingers having a surface of friction material disposed below the stripper fingers to be engaged by the forward end of the successive curled sections.

16. A machine for forming paper sticks as set forth in claim 15 wherein the stripper finger supporting member carries a series of spaced fingers disposed below the friction surface, such series of fingers cooperating with a similar series of fingers extending upwardly from the intake end of the entry sector to provide a smooth surface of transition onto the sector member for the paper coils.

17. In a machine for forming paper sticks by tightly rolling and compacting sections of paper web, a pair of feed rolls rotated to feed the web continuously, a pair of continuously rotating crimping rolls spaced from the feed rolls in the direction of web travel and arranged to receive the web from the feed rolls, cooperating movable and stationary knife members disposed between the feed rolls and crimping rolls, the movable knife having a sloping serrated edge, said knife members having their cooperating edges parallel with the web so as to sever the web instantaneously from edge to edge, means for reciprocating the movable knife member at a speed such that the cut is instantaneous, the web having an instantaneous drag applied thereto by the knife during the cut, means for operating the crimping rolls at a slightly higher speed than the feed rolls so that during the final severing action there is a tendency to tear apart the tips of the serrations formed by the serrated knife, the web being severed into successive sections, the crimping rolls operating to curl said sections and means for rolling and compacting the curled sections to form paper sticks.

18. In a machine for feeding paper web to a mechanism for performing an operation thereon, means for supporting a roll containing a supply of paper web, a pair of feed rolls for drawing the web from the supply roll and delivering it to said mechanism, means for continuously rotating

the feed rolls, a web guide roll disposed in spaced relation to and at one side of the supply roll, the axis of such guide roll being parallel with the axis of the supply roll, the web passing from the supply roll to the guide roll, thence, moving in the same direction as the surface of the supply roll, into frictional engagement therewith, and thence to the pair of feed rolls, the supply roll being disposed to redirect the web to the feed rolls, and the tension applied to the web by the feed rolls being transmitted to the supply roll to rotate the same partly by frictional engagement of the web with the outside layer of the supply roll and partly by pull on the supply roll at the take off point of the web.

19. A machine for feeding paper web as set forth in claim 18 wherein the frictional engagement of the web with the surface of the supply roll extends throughout approximately 90°

20. A machine for feeding paper web as set forth in claim 18 wherein two guide rolls are disposed at one side of the supply roll, these guide rolls being spaced apart vertically so as to prevent too great an angular contact of the web with the supply roll regardless of the diameter of the supply roll.

21. In a machine for making paper sticks by tightly rolling and compacting sections of paper web, a drum arranged to rotate continuously on a fixed horizontal axis, a series of rigid sector members disposed around the periphery of the drum but extending less than the full circumference thereof, the surfaces of the drum and of the series of sector members forming a rolling and compacting channel of generally circular form but of gradually diminishing thickness from its entrance end to the discharge end, the intake and discharge ends of the channel being disposed on the same side of the machine and having upper and lower shelves extending horizontally therefrom, the lower shelf having a frame structure associated therewith, and a plurality of cross shafts rotationally supported by said frame structure, a positively driven feed roll and a positively driven crimping roll carried by two of said shafts substantially at the surface of the lower shelf, pressure rolls cooperating with said respective feeding and crimping rolls, web severing means disposed between said feeding and crimping rolls and including a stationary knife member and a movable knife member, gearing interconnecting said rotary shafts and including a driving connection with said cam, a discharge conveyor associated with the upper shelf, a cross shaft supported in said frame for driving the conveyor, and a gear train interconnecting the conveyor drive shaft with the gearing for driving the feed roll and crimping shafts, the said rolls and said gearing being disposed below the upper shelf.

22. A machine for making paper sticks as set forth in claim 21 wherein a pivoted support is mounted on said frame above the in-feed shelf, said support extending crosswise of the machine and having bearings for the pressure roll which cooperates with the feed roll, manually actuated locking means between said pivoted support and said frame for maintaining the support in horizontal position with said rolls in cooperative relationship, said support being swingable upwardly upon release of the locking means for separating the pressure roll from the feed roll to facilitate the entrance of a paper web between said rolls.

23. In a machine for forming paper sticks by tightly rolling and compacting sections of paper web, a drum arranged to rotate continuously on a fixed horizontal axis, a supporting frame therefor, sector members including an entry member arranged in end-to-end relationship and supported on said frame to partially surround the drum and form therewith a stick rolling and reducing channel of diminishing thickness from the in-feed end to the discharge end thereof, web feeding, severing and crimping mechanism arranged to supply successive sections of paper of uniform length and partially curled to the in-feed end of the entry member, a supply roll of paper web, and means for supporting and aligning the roll with the web feeding mechanism comprising, a shaft mounted for free horizontal rotation but non-shiftable lengthwise, a sleeve carried by said shaft and rotatively interconnected therewith but slidable lengthwise of the shaft, a reel for the supply roll fixed to the sleeve, and means for adjusting the sleeve lengthwise of the shaft for aligning the reel with the web feeding mechanism.

24. A machine for forming paper sticks as set forth in claim 23 wherein the reel is provided with an inner flange which is fixed to the sleeve, and with an outer flange, the outer flange being removably secured to the sleeve so as to permit the replenishing of the roll of paper web thereon.

25. A machine for forming paper sticks as set forth in claim 24 wherein the outer end of the sleeve is externally threaded, and wherein the outer flange is held in position on the sleeve by a blade member which extends crosswise of the sleeve for engaging between a pair of adjacent threads, and means for pivotally and resiliently urging the blade member into engagement with the threads.

26. In a machine for forming paper sticks by tightly rolling and compacting sections of paper web, a pair of feed rolls rotated to feed the web continuously, a pair of continuously rotating crimping rolls spaced from the feed rolls in the direction of web travel and arranged to receive the web from the feed rolls, cooperating web-severing rolls disposed between the feed rolls and crimping rolls, said rolls carrying respectively a punch member and a die member, the punch being in the form of a radially mounted bar extending lengthwise of its supporting roll and having one edge projecting beyond the surface thereof, the bar having a punching face extending along the projecting edge in a zigzag formation from side to side of the bar, the die member having a recess therein of corresponding zigzag formation from side to side, means for rotating the web-severing rolls in timed relation to each other to cause the punch and die to cooperate with one another, the punch and die extending throughout the width of the web and operating to sever the web instantaneously from edge to edge along a serrated line, means for operating the crimping rolls at a slightly higher speed than the punch and die rolls so that during the severing action there is a tendency to tear apart the tips of the serrations formed by the punch and die, and means for rolling and compacting the sections of the web to form paper sticks, the crimping rolls operating to curl said sections and feed them successively to the rolling and compacting means.

27. In a machine for severing sections from a paper web, a pair of feed rolls rotated to feed the web continuously, a second pair of continuously rotating delivering rolls spaced from the feed rolls in the direction of web travel and arranged to receive the web from the feed rolls, cooperating web-severing rolls disposed between the feed rolls and delivering rolls, said rolls carrying respectively a punch member and a die member, the punch being in the form of a radially mounted bar extending lengthwise of its supporting roll and having one edge projecting beyond the surface thereof, the bar having a punching face extending along the projecting edge in a zigzag formation from side to side of the bar, the die member having a recess therein of corresponding zigzag formation from side to side, means for rotating the web-severing rolls in timed relation to each other to cause the punch and die to cooperate with one another, the punch and die extending throughout the width of the web and operating to sever the web instantaneously from edge to edge along a serrated line, means for operating the crimping rolls at a slightly higher speed than the punch and die rolls so that during the severing action there is a tendency to tear apart the tips of the serrations formed by the punch and die, the delivering rolls operating to feed them successively away from the web-severing rolls.

28. A machine for severing sections from a paper web as set forth in claim 27 wherein the die member is composed of a layer of fibrous material which is relatively soft as compared to the material of the punch and having a recess therein of zigzag formation from side to side corresponding to the configuration of the punch.

29. In a machine for forming paper sticks by tightly rolling and compacting sections of paper web, a drum arranged to rotate continuously on a fixed horizontal axis, a supporting frame therefor, sector members including an entry member arranged in end-to-end relationship and supported on said frame to partially surround the drum and form therewith a stick rolling and reducing channel of diminishing thickness from the in-feed end to the discharge end thereof, web feeding, severing and crimping mechanism arranged to supply successive sections of paper of uniform length and partially curled to the in-feed end of the entry member, a supply roll of paper web, and means for supporting and aligning the roll with the web feeding mechanism comprising a supporting shaft fixed against lengthwise movement, a sleeve carried by the shaft and slideable lengthwise thereof, a reel for the supply

roll fixed to the sleeve, and means for adjusting the sleeve lengthwise of the shaft for aligning the reel with the web feeding mechanism.

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