April 27, 1937. R. W. JAITE 2,078,496

MACHINE FOR MAKING PAPER BAGS

Filed Dec. 16, 1931 7 Sheets-Sheet 1

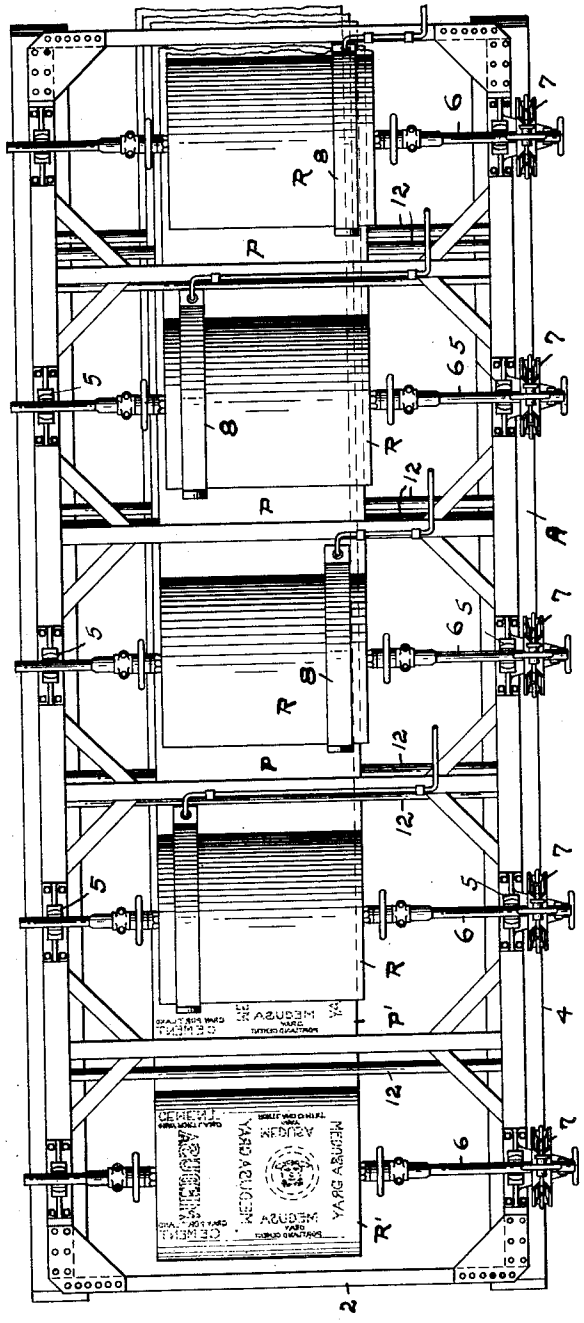


FIG. 1

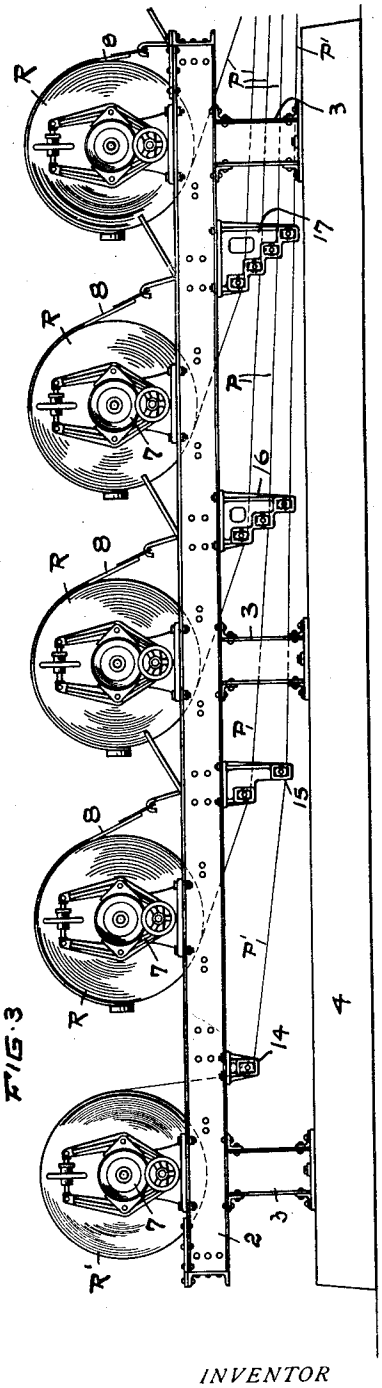


FIG. 3

INVENTOR
ROY W. JAITE
BY Fisher, Moser & Moore
ATTORNEY

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MACHINE FOR MAKING PAPER BAGS

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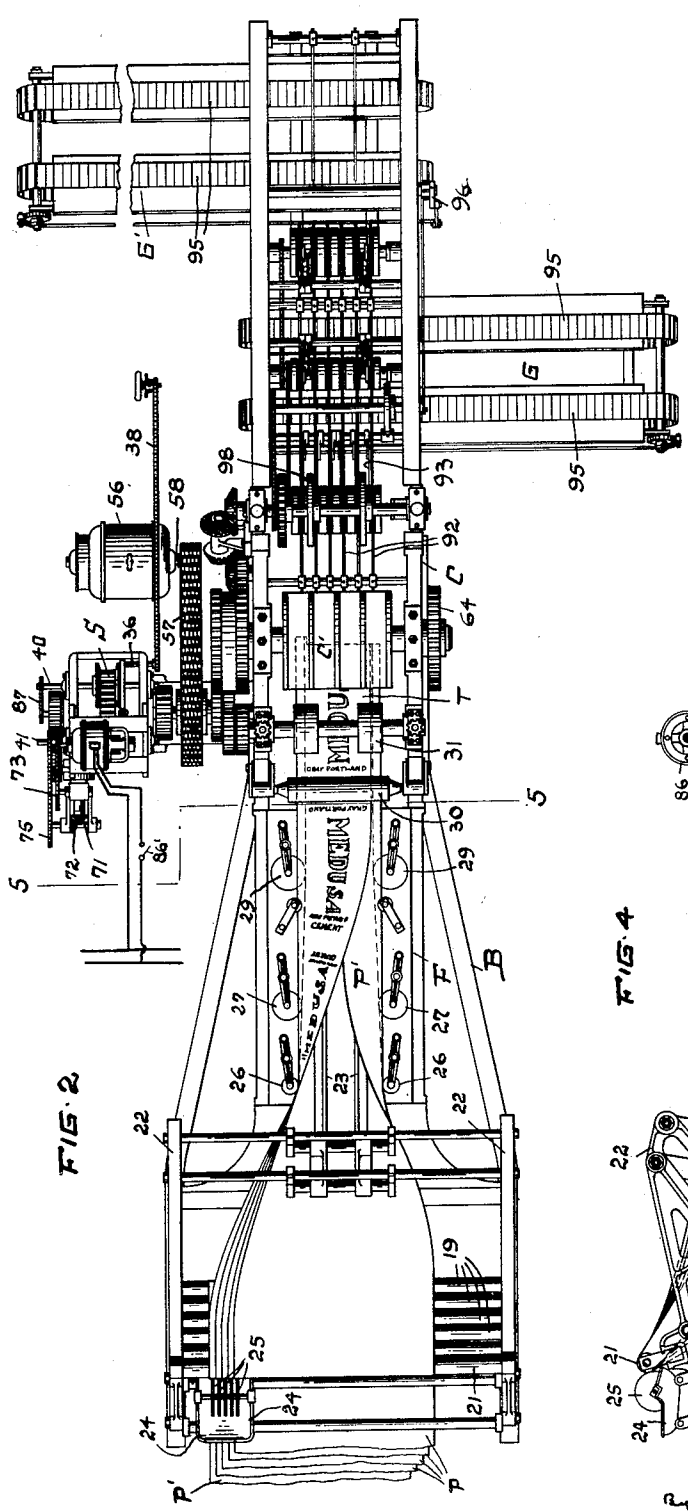


FIG. 2

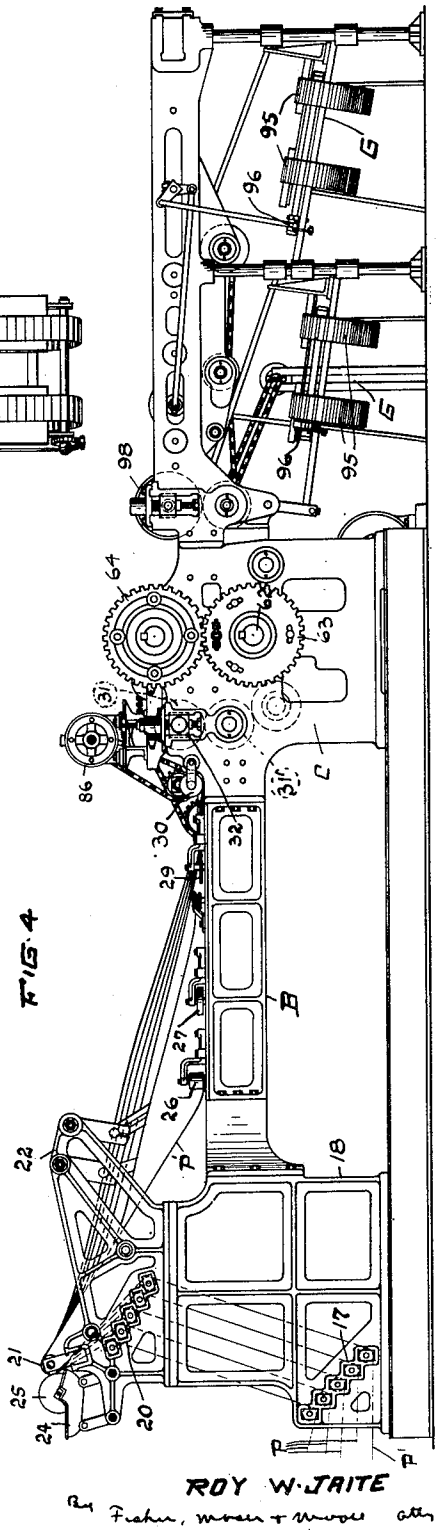


FIG. 4

ROY W. JAITE

By Fisher, Morsell & Morsell Attys

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MACHINE FOR MAKING PAPER BAGS

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FIG. 5

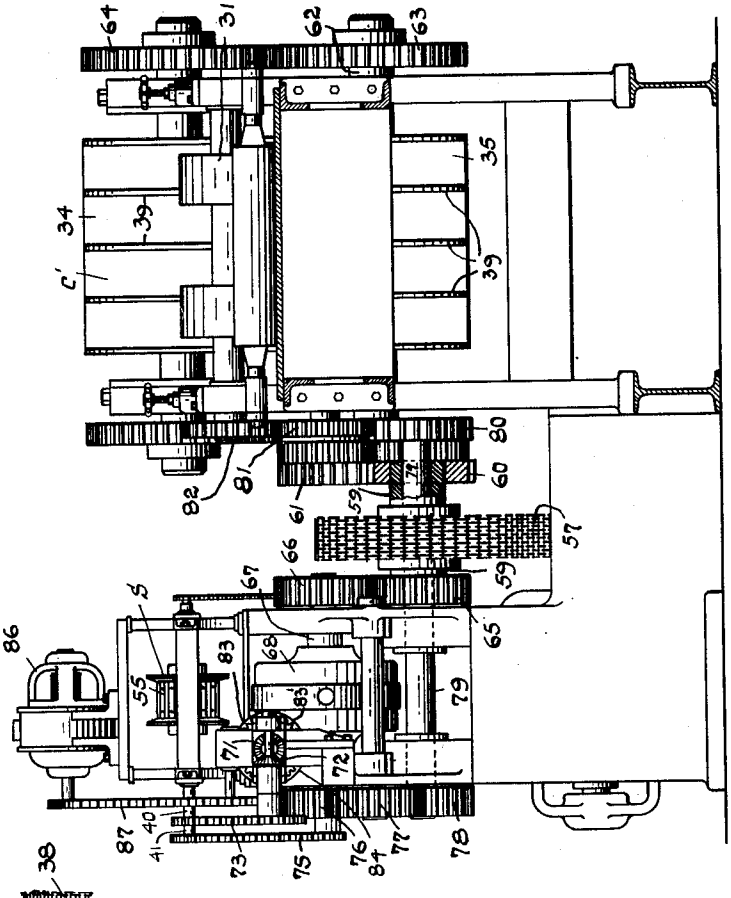
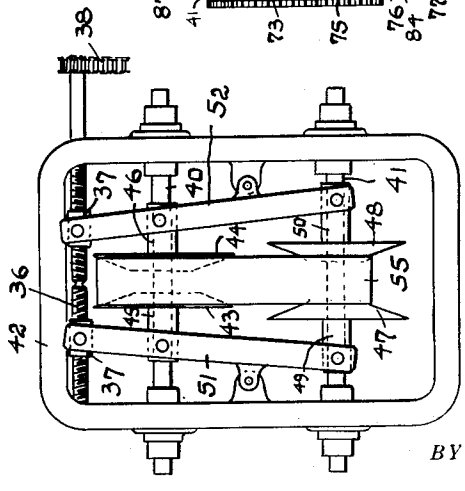


FIG. 7



INVENTOR
ROY W. JAITE
BY Parker, Wood & Wood
ATTORNEY

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MACHINE FOR MAKING PAPER BAGS

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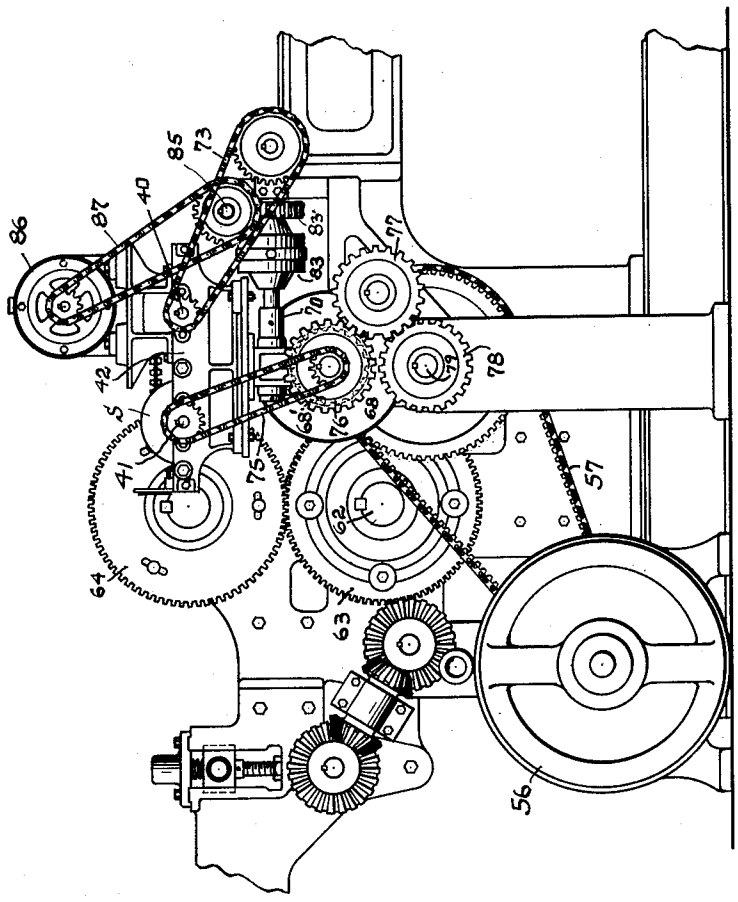


FIG. 6

INVENTOR
ROY W. JAITE

BY Fisher, Mason & Mason
ATTORNEY

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MACHINE FOR MAKING PAPER BAGS

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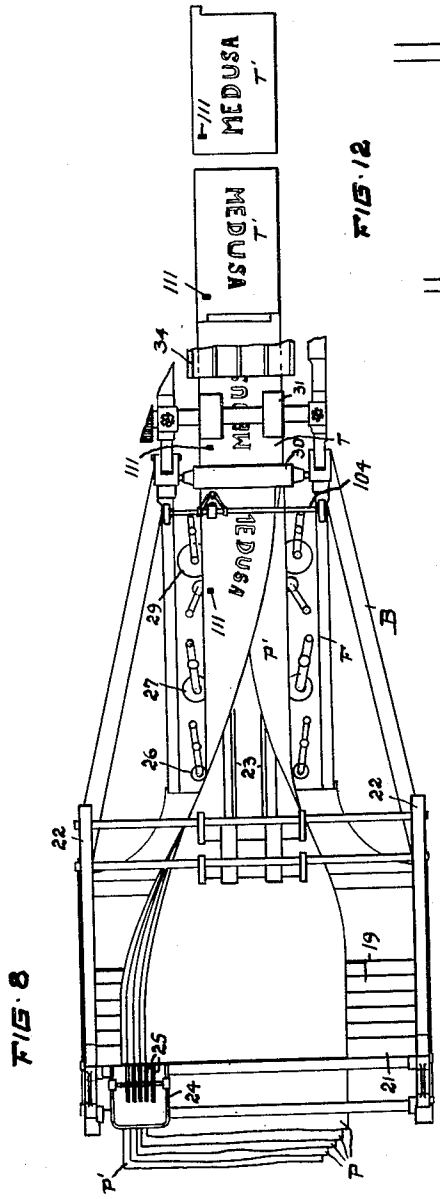


FIG. 8

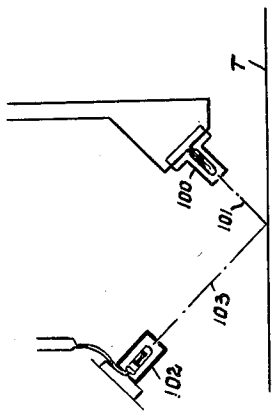


FIG. 12

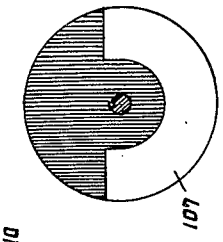


FIG. 11

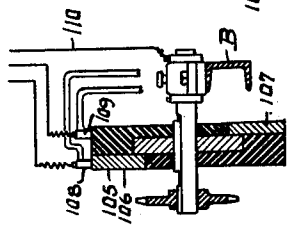


FIG. 10

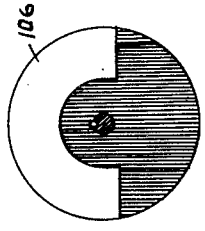


FIG. 9

INVENTOR

ROY W. JAITE

BY

Fisher, Moser & Wood.

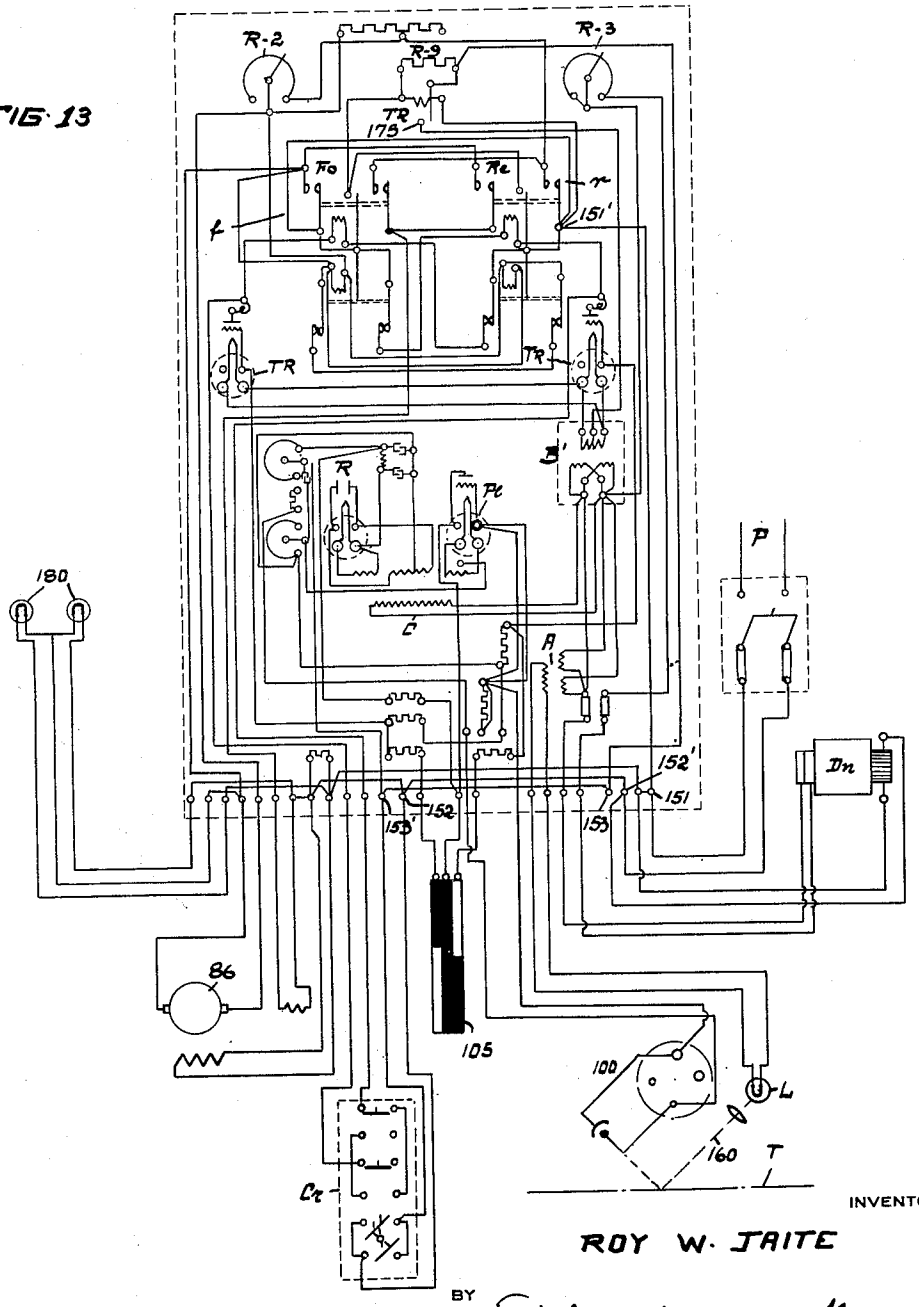
ATTORNEY

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MACHINE FOR MAKING PAPER BAGS

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FIG. 13



INVENTOR

ROY W. JAITE

BY Fisher, Moser & Moore

ATTORNEY

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MACHINE FOR MAKING PAPER BAGS

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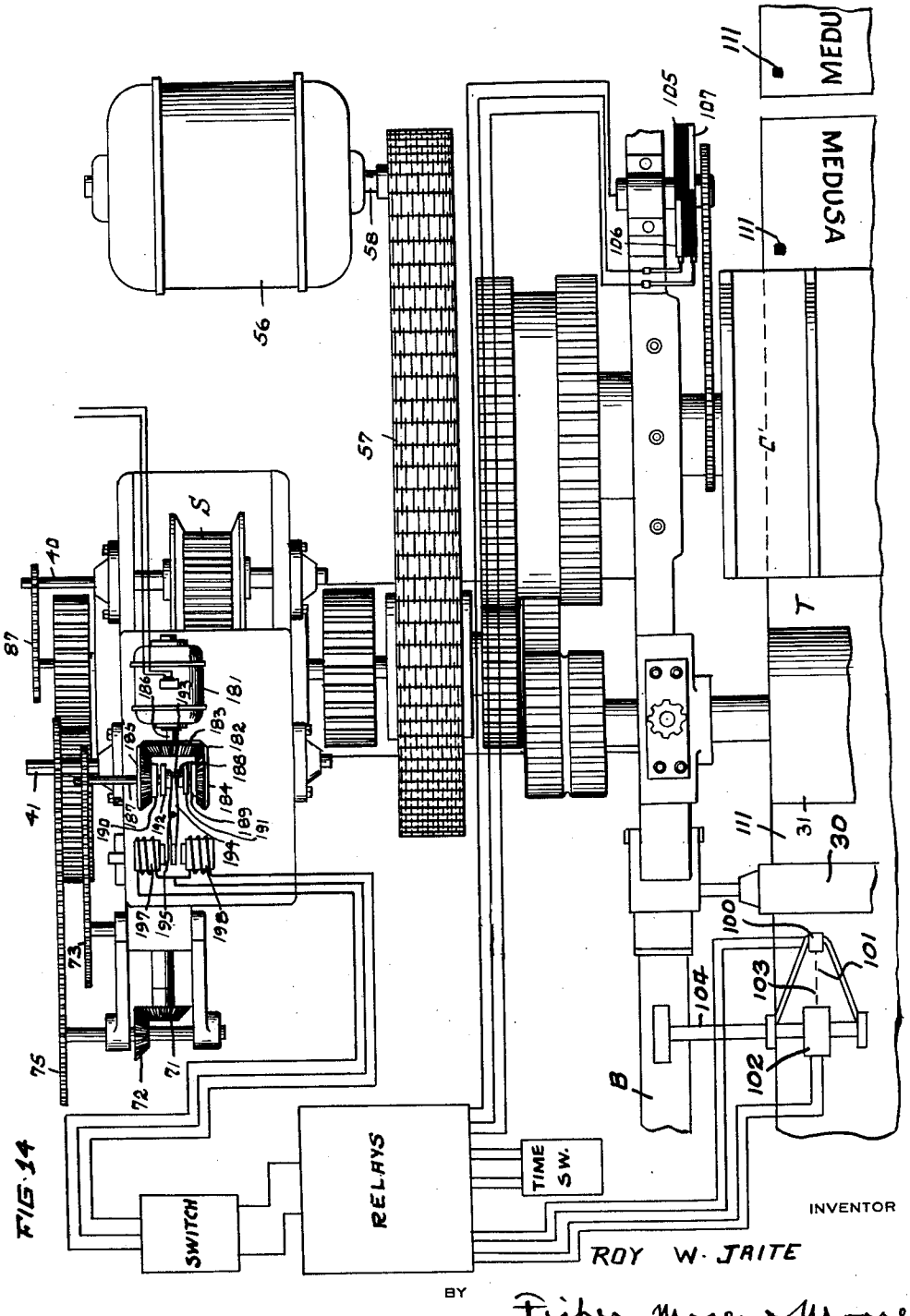


FIG. 14

Patented Apr. 27, 1937

2,078,496

UNITED STATES PATENT OFFICE

2,078,496

MACHINE FOR MAKING PAPER BAGS

Roy W. Jaite, Lakewood, Ohio

Application December 16, 1931, Serial No. 581,379

1 Claim. (Cl. 164—68)

This invention relates in general to machines for making paper bags, which have their opposite ends closed, such for example, as the so-called valve type bags, in which the body of the bag is composed of a multiple or plural number of flat tubes or tubular plies, and provided with a self-closing valve in one angular corner and in which the front and rear faces of the bag disclose printed matter such as a trade-mark, the name and location of the manufacturer and other necessary information concerning the goods in the bags. As generally practiced the bags are cut from a continuous plicated tube produced in a tubing machine and separated on predetermined lines to form a series of adjoining tube sections, each of which has in one angular corner thereof an integral narrow extension, supplying the necessary stock for the self-closing valve. The cutting lines are so chosen that the extensions of adjoining sections are formed on opposite edges thereof and that these lines form either the top edges or the bottom edges of adjoining tube sections and therefore the waste incident to the cutting operations is held to a minimum. The forming and cutting of the plicated tube produces tube sections having their tops facing alternately in opposite directions and therefore special separating or gathering means are employed to segregate those tube sections having their tops facing in the same direction from those facing in the opposite direction.

In the manufacture of the tube and the tube sections, the paper forming the tube is drawn under substantial speed (4 to 5 ft. per second) through a tubing machine by means of driven pull rolls, timed with respect to the rotary cutting mechanism of the machine. These rolls slip more or less, while pulling the paper and therefore the tube sections severed from the formed tube by the power operated rotary cutting mechanism vary slightly in length. While ordinarily slipping of the rolls is of little importance, it does great harm, where the paper forming the top and bottom faces of the finished bag has been printed or marked prior to the forming of the tube, as in this case the continuous tube will not be severed at the predetermined lines, and the printing will be mutilated.

The general object of the present invention is to provide a machine which includes means to adjust and compensate for any retardation of the forward travel of the paper and tube on account of slippage of the pull rollers. Such object is accomplished by adjusting the speed of rotation of the pull rollers in accordance with the slippage of the rollers by means of a compensating device, preferably a variable speed transmission of the type described in the patent to Reeves, No. 1,505,427, which transmission permits wide ranges of speed.

The compensating device is manually controlled by an operator but may be automatically controlled for instance, by a photo-cell or a neon lamp, and is utilized to time the forward movement of the tube in accordance with the rotative speed of the cutting rolls, all as hereinafter more fully described and brought out in the following description of a preferred form of the invention and the attached drawings forming part thereof, and as more concisely pointed out in the appended claim.

In the accompanying drawings, Figs. 1 and 2 are respective plan views of a tubing machine showing the cutting, delivering and conveying mechanism and the compensating mechanism for increasing the speed of the drawing rolls, when the speed of the traveling tube decreases and the sections therefore are not severed from the tube at the proper predetermined transverse cutting lines. Figs. 3 and 4 are side elevations of the tubing machine shown in Figs. 1 and 2. Fig. 5 is a cross sectional view on line 5—5 of Fig. 2, showing the compensating mechanism, a Reeves drive in end elevation, and Fig. 6 is a front elevation of the compensating device attached to or coupled with the tubing machine. Fig. 7 is a plan view of the variable speed transmission. Fig. 8 is a fragmentary plan view of the tubing machine shown in Fig. 1 with a light controlled compensating mechanism for increasing or decreasing the rotation speed of the drawing rolls with respect to the rotation speed of the cutting device, a photo tube being employed for such purpose. Figs. 9, 10, and 11, are front, rear and sectional views of the rotatable electric switch member used for controlling the respective electric circuits in turn governing a reversible motor for actuating the compensating device and Fig. 12 is a diagrammatic view of the mechanical eye or photo tube employed for controlling the current flow in the electric circuits referred to above and timing the drawing rolls with respect to the cutting device. Fig. 13 is an electrical diagram showing the hook-up of the photo tube with the controlling circuits of the reversible motor, actuating the compensating device. Fig. 14 is a simplified form of an automatically controlled compensating device having a continuously running motor and gear and

clutch mechanism actuated by the electric circuits referred to above for rotating the compensating device in one or the other direction.

The tubing machine herein described is designed to produce a plicated tube, and then cut said tube into sections, having an integral extension, adapted to form the valve wings of a self-closing valve in the finished bag. The machine comprises three sections, the paper supply section A, the forming and tubing section B, and the cutting and delivery section C, which sections of course continuously co-operate in producing the finished product. The paper supply or feeding section A furnishes a plurality of wide paper sheets to the forming and tubing section B of the machine. For such purpose, a series of large rolls R of plain paper P and a large roll R' of previously printed paper P' are mounted upon a rectangular main frame 2, of channel iron construction, having legs 3 mounted on a base 4. Main frame 2 carries a series of bearing brackets 5, adapted to removably support the projecting ends of shafts 6 carrying rolls R—R', which are laterally offset or stepped with respect to each other to cause the overlapping seams of the individual tubes to lie in offset relation to each other. Adjustable brake members 7 and adjustable friction belts 8 retard the rotation of the rolls and keep the paper sheets P—P' under tension as they unwind from rolls R—R', and pass downwardly around rollers 12, journaled at their opposite ends in bearings 14, 15, and 16, suspended from main frame 2, and thence around corresponding rollers 12 in bearings 17 mounted in frame 18 of the forming and tubing section B. After passing around rollers 12 in bearings 17, sheets P—P' pass upwards toward and around a single idler roller 21, situated upon the top of frame 18 adjacent a paste pot 24 from which a series of paste applying wheels 25 transfer narrow bands of paste continuously to the face of the stepped paper sheets P—P' near one longitudinal edge thereof.

After the sheets of paper P—P' have been supplied with paste, they are simultaneously folded into a flat plicated tube T while passing lengthwise of a tube-forming device F, including shoe 23 suspended from arms 22 of frame 18, a pair of rollers 26, a pair of flat rollers 27, and a pair of idler roller disks 29. During the folding operations the printed sheet P' is folded around the sheets P so that the plicated tube exposes the printed matter on opposite sides thereof.

The operation of folding the sheets into a plicated tube and the accompanying pasting operations also involve the use of a horizontal roller 30 and a pair of upper and lower pull and presser rollers 31—31' guided in adjustable bearings 32. When rolls 31—31' are driven, a pulling tension is maintained on the sheets of paper and tube T and furthermore the creased border edges of the tube are pressed and sharply defined before the tube passes upward to the cutting and delivery section of the machine. While rolls 31—31' draw the paper and tube at great speed from the paper supply section to and through the tube forming section, the speed being approximately 4 to 5 feet per second, a continuously varying slipping action of rolls 31—31' occurs with respect to tube T amounting to about 10% or more of the forward travel of the tube. This varying percentage of slippage is caused by varying surface conditions of the printed cover sheet of tube T, the moisture percentage and temperature of the shop in which the tubing machine is running, the adjustment of brake members 7 and 8 and many other conditions. This necessitates the provision of counteracting or compensating means for stepping up the speed of rollers 31—31' so that the continuously driven rotary cutting device C' which severs the tube in equal sections may rotate with equal speed and always cut tube T along its predetermined separating lines.

The above desideratum is obtained by means of a variable speed transmission S consisting of two parallel shafts 40, 41, suitably journaled in a supporting frame 42. The shaft 40 has a pair of cone disks 43, 44, respectively splined thereto which disks are provided with projecting hubs 45, 46. A similar pair of disks 47, 48 having hubs 49, 50 projecting therefrom are splined to shaft 41. The corresponding hubs of each pair of disks engage levers 51—52, pivoted to the frame 42 intermediate of the shafts 40 and 41 and adapted to oscillate on their pivots to move one pair of disks toward each other and simultaneously therewith move the other pair apart. A beveled edge drive belt 55 extends between the pairs of disks and as the disks of one pair move toward each other belt 55 assumes a greater driving diameter at that end, while the disks of the other pair move apart and cause the belt to assume a smaller driving diameter at its other end, thus varying the speed of one shaft relatively to the other. The levers 51, 52, are actuated by an elongated threaded screw 36, oppositely screw-threaded on opposite sides of its center and operating in suitable nuts 37 connected to the ends of said levers. A chain and hand wheel drive 38 is provided for manually turning screw 36 to effect adjustment of the variable speed transmission, from time to time.

In the cutting and delivery section a rotary cutting device C' is directly driven from motor 56 by means of a belt 57, which connects the motor shaft 58 with a hollow shaft 59, on which is mounted a gear 60, meshing with gear 61 on shaft 62 of cutting roll 35, in turn driving platen roll 34 by means of gears 63, 64. The pull or draw rollers 31, 31' are driven from motor 56 by gearing and drive mechanism including the variable speed transmission S. Thus, motor 56 drives shaft 40 of said transmission by means of a gear 65 on hollow shaft 59, which gear in turn meshes with a gear 66 on shaft 67 of fly wheel 68. Fly wheel 68 is provided with worm teeth 68' which mesh with and drive a split worm shaft 70, which in turn drives shaft 40, through gears 71, 72, and sprocket chain drive 73. The other shaft 41 of the variable speed transmission S drives the pull rollers 31—31'. Thus, shaft 41 imparts rotation to pull rolls 31—31' by means of a sprocket chain drive 75, gears 76, 77, 78, shaft 79, extending through shaft 59, and gears 80, 81, and 82.

In case that the slippage of the paper increases after adjustment has been made by hand wheel drive 38, thus necessitating speeding up of pull rolls 31—31', the operator again shifts levers 51, 52, in appropriate direction by turning chain and hand wheel drive 38 so that the ratio of transmission between shaft 40, 41, is changed and proper speed relation between rotary cutting device C and pull rolls 31—31' is obtained. That operation is reversed when slippage decreases and necessitates reducing the speed of rolls 31—31'.

The structure so far described takes care of ordinary slippage of rolls 31—31' with respect

to tube T. However, under certain conditions, for instance in starting the machine after a new roll R' of printed paper P' has been installed the rotary cutting device C' is generally so far out of alignment with the predetermined separating lines on tube T, that it becomes necessary to advance the tube while the cutting device is either idle or slowed down, in order to prevent the substantial waste which would otherwise occur by the cutting of the tube on other than predetermined lines. This is accomplished by a preferably reversible motor 86, coupled with split wormshaft 70. Thus, worm shaft 70 supports a rotatably mounted differential device 83, the casing 84 of which carries worm teeth 83' meshing with a worm drive 85 which in turn is coupled with motor 86 by a sprocket chain drive 87. Actuation of motor 86 by operation of a double pole switch member 86' rotates worm drive 85 and therewith shaft 40 of the variable speed transmission S by means of casing 84, bevel gears 71, 72 and sprocket chain drive 73. Shaft 40 in turn drives shaft 41 by means of belt 55, thus rotating pull rolls 31—31' independently of motor 56, which drives the cutting mechanism and therefore advances tube T to said rotary cutting device either while the machine is running or at a standstill, in order to bring the predetermined imaginary cutting lines on the tube in line with the path of movement of the cutting knives.

Generally speaking, the manual variation of the speed ratio of shafts 40 and 41 during operation of the tubing machine is sufficient to compensate for loss in forward travel of the tube but the operator may also use motor 86 in order to more rapidly re-align the predetermined cutting lines of the tube and rotary cutting device C'.

As previously described tube T is advanced by means of rolls 31—31' to the rotary cutting device C', including a platen roll 34 and a cutting roll 35, where the tube T is severed into sections T'. These rolls 34 and 35 are of equal diameters and the cutting roll is provided with cutting blades so positioned that two equal sections T' are cut from tube T, during one complete revolution of the rolls. The body of each roll 34 and 35 also forms a series of half-circular narrow flanges 39, adapted to draw the plicated tube T into the cutting rolls and to force the tube sections T' severed therefrom to their respective conveyors G—G', as clearly described and shown in my copending application, Serial No. 545,408, filed June 19, 1931.

The finished tube T is guided by a plurality of pairs of laterally spaced tracks or guide members 92, preferably formed of narrow steel bars, which tracks extend in spaced relation over the entire width of the bag, but are interrupted adjacent the rolls 34—35 to permit separating alternate finished tube sections and conveying such sections to different points. This is accomplished by means of a plurality of rocking switch members 93 adapted to deflect or guide alternate sections to conveyors G—G' respectively, a pair of driven rollers 98 being employed to advance the tube sections forwardly. Each conveyor consists of a pair of endless belts 95 intermittently driven by a ratchet mechanism 96. The conveyors G—G' are identical in construction and so driven by ratchet mechanism 96 that the two conveyors advance alternately.

Manually controlled compensating devices for tubing machines of the type described depend upon proper control and handling of the variable speed transmission by the operator. Such dependency upon the skill and diligence of the operator is overcome according to the invention by automatic control of the compensating device for such purpose. A mechanical eye or photo tube is employed which automatically adjusts the variable speed transmission for proper timing of the drawing rolls and cutting device. A machine embodying an automatic control for the variable speed transmission is shown in Fig. 8, which figure discloses a tubing machine and compensating device generally following the outline of the structure of Figs. 1 through 4. The means to adjust and compensate for retardation or acceleration of the forward travel of the paper embody the usual variable speed transmission S, which is controlled by a reversible motor 86 in turn coupled with split worm-shaft 70 as previously described. Motor 86 is controlled by electric circuits *f* and *r* for forward and reverse rotation. A photo tube 100 coupled with these circuits governs the current flow therein and this tube is subjected to the reflected light rays 101 of an incandescent lamp 102 which projects a light beam 103 at an inclination of approximately 45° upon the surface of the paper tube T. Photo tube 100 and lamp 102 are laterally adjustably mounted on a bracket 104 attached to frame B close to idler 30. A rotatable switch member 105 driven by and timed with respect to platen roll 34 alternately connects photo tube 100 with circuits *f* and *r* and effects control of these circuits at predetermined intervals. Switch member 105 includes two oppositely and diametrically arranged contact segments 106 and 107 for circuits *f* and *r* respectively, which segments contact with contact brushes 108 and 109 and are electrically connected to a feed wire 110, so that rotation of the switch alternately connects feed wire 110 with brushes 108 and 109. The flow of current in feed wire 110 is therefore governed by photo-tube 100 and consequently the flow of current in circuits *f* and *r* is also governed by said photo tube. The diametrically arranged contact segments 106 and 107 are dimensioned to assure simultaneous control of both circuits *f* and *r* by photo tube 100 for a short interval. During this interval a change in the potential of the phototube 100 is effected by dark spots, or marks 111 on tube T. These spots are arranged on tube T in spaced relationship in alignment with light beam 103 and photo-tube 100.

When the spots or marks 111 are properly timed with respect to switch member 105 a change in potential of photo-tube 100 will effect both circuits *f* and *r* and therefore the motor cannot be rotated, in other words, when the forward travel of tube T is properly timed with respect to the rotary cutting mechanism the compensating device is inactive. However, slightest decrease or increase in the forward movement of tube T with respect to the cutting mechanism and its platen roll 34 induces rotation of motor 86 by the respective circuits *f* or *r* so that the compensating device adjusts and compensates immediately for any decrease or increase in the longitudinal movement of tube T.

The working of photo tube 100 will better be understood from the wiring diagram shown in Fig. 13. This diagram shows a direct current reversible pilot motor 86 having a series and a shunt field winding and is fed from a power line P. The current of said power line passes from contact 151 over 151' to a relay TR, a resistance R—9 to contact 153 and hence over switch Cr and contacts 153' and 152, and 152' back to power

line P. Actuation of switch Cr therefore energizes relay TR, and thus closes contact 175, which governs relay circuits *f* and *r* for two double pole contact relays Fo and Re. The current of power line P also operates a motor generator Dn, which sends its alternating current through transformer A to a lighting circuit of an incandescent light source L, through transformer B' to relay circuits *f* and *r* provided with thyratron tubes for relays Fo and Re and through transformers C to a rectifier tube R and a pliotron tube Pl. It can readily be seen that the alternating current of motor generator Dn heats the filaments of all the tubes mentioned.

The light source L projects a narrow light beam 160 at an inclination upon the surface of forwardly moving paper tube T, and the reflected rays of this beam are projected on photo-tube 100. These reflected rays change the potential of tube 100 and as tube 100 is electrically connected with the grids of pliotron tube Pl any change in potential of photo-tube 100 will effect a change in potential of said grids. As previously described, such change in potential of photo-tube 100 is effected by spaced spots or marks 111 on the advancing paper tube. The potential of the photo-tube changes effects similar potential changes in the grids of the thyratron tubes TR, electrically connected to the plate of the pliotron tube Pl, and this connection is governed by a rotatable switch member 105 alternately connecting said plate with the grid of one or the other of said thyratron tubes and for a short interval connecting the grid of each of said thyratron tubes simultaneously with said plate.

Transformer B feeds the relay circuits *f* and *r* for relays Fo and Re and actuates said relays so that the motor 86 will be rotated in one or the other direction when marks 111 are not properly timed with respect to rotating switch 105.

A series of lamps 180 indicate proper working of the device and adjustable resistances R—2 and R—3 are used to control the voltage and amperage of the pilot motor and the motor generator respectively.

The previously described compensating structure embodies a reversible motor but I have found that I can materially simplify the controlling mechanism for the compensating structure by using a non-reversible motor. Such a device is disclosed in Fig. 14 in which 181 denotes a non-reversible pilot motor coupled over a gear box 182 with split worm shaft 70. Gear box 182 includes a bevel gear system of three bevel gears, a central bevel gear 183 and two side bevel gears 184 and 185, respectively, which mesh at opposed sides with central bevel gear 183. A shaft 186 connects gear 183 with motor 181. Bevel gears 184 and 185 are freely rotatably mounted upon a shaft 187, carrying a sleeve member 188, slidably and non-rotatably mounted on said shaft. The opposed faces of bevel gears 184 and 185 carry clutching plates 189 and 190 respectively, cooperating with similar clutching faces 191, 192 on opposite ends of sleeve member 188. A lever 194 engaging a circular groove 193 in sleeve member 188 effects shifting thereof. Thus, lever 194 is pivotally mounted at 195 and its free end 196 extends between two electro-magnets 197 and 198. The coils of these magnets are controlled by relay circuits similar to the circuits *f* and *r* shown and described in Fig. 13.

It can readily be seen that energizing of one or the other of electro-magnets 197, 198 induces shifting of lever 194, which thus couples shaft 187 with motor 181 for forward or reverse drive. Motor 181 runs of course continuously. In all other respects the structure of Fig. 14 is similar in action and construction to the structure of Figs. 8 through 13, and therefore further description would be superfluous.

What I claim, is:

In a tubing machine for making tubular sections of equal length from elongated sheets of papers, driven draw rolls to pull continuous sheets of paper marked at definite places by printing and the tube formed therefrom through said machine, a driven rotary cutter for severing the formed tube into equal tube sections, a single power means for driving said draw rolls and said rotary cutter, an individually adjustable variable speed transmission to vary the speed of said draw rolls with respect to the speed of said rotary cutter, a non-reversible pilot motor for setting said variable speed transmission for a positional change in the cutter, reversible coupling means between said motor and said variable speed transmission and automatic means co-operating with the printed marks on said paper sheet and governing said reversible coupling means.

ROY W. JAITE.