

EUROPEAN PATENT APPLICATION

Application number: 82301978.1

Int. Cl.³: **B 31 B 27/14, B 31 B 27/64,**
B 31 B 27/92

Date of filing: 16.04.82

Priority: 05.08.81 ZA 815383

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Date of publication of application: 16.02.83
Bulletin 83/7

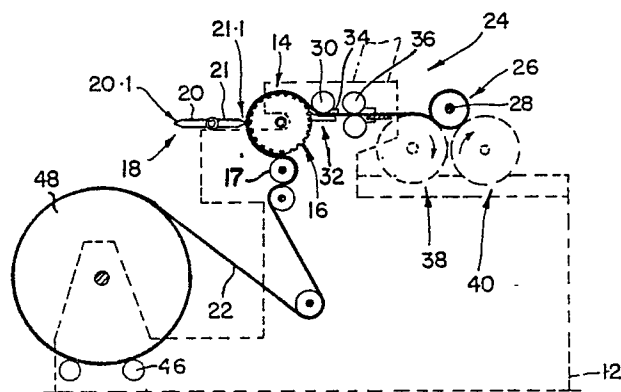
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Designated Contracting States: **AT BE CH DE FR GB IT**
LI LU NL SE

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Method of manufacture of bags from synthetic plastics material and apparatus therefor.

Apparatus for making side-sealed bags (22.1, 22.2, 22.3) from a double-layer web (22) of thin synthetic plastics film. The apparatus includes a rotatably mounted sealing drum (14) having a plurality of circumferentially spaced axially extending slots (16) in its periphery. In use, the web (22) moves belt-fashion over the slots (16) in contact with the drum (14). A sealing rotor (18) running in synchronism with the drum (14) has a heat cutter member (20, 21) which intersects the web (22) at circumferentially spaced intervals by passing cyclically into the slots (16) of the drum (14). The heat cutter member (20, 21) has spaced interruptions (21.2) along its length which result in spaced perforations (160.1) being made across the width of the web (22). The two layers (22.11, 22.12) of film are welded together at such perforations (160.1), thus forming side-sealed bags separated by zones of weakness (160). The web (22) is rolled up into a roll (26) of such side-sealed bags (22.1, 22.2, 22.3). The sealing rate and web speed can be adjusted to match the rate of extrusion of an extruder (242).



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METHOD OF MANUFACTURE OF BAGS FROM SYNTHETIC
PLASTICS MATERIAL AND APPARATUS THEREFOR.

THIS INVENTION relates to the manufacture of bags from synthetic plastics film, and to apparatus therefor.

It is an object of this invention to make the bags in the form of a continuous web of thin synthetic plastics film.

According to the invention, a method of manufacturing bags from a double layer web of synthetic plastics film, includes

running the web in contact with the surface of a rotating sealing drum having a plurality of axially extending circumferentially spaced slots;

running a sealing rotor in synchronism with the sealing drum, the sealing rotor having a heat cutter member with at least one hot sealing edge having interruptions spaced along its length, the sealing edge cyclically entering a slot of the sealing drum and intersecting the layers of the film and perforating them at spaced intervals along the length of the sealing edge and across the width of the web and sealing the two layers of film together at such perforations, which thereby provide longitudinally spaced transverse zones of weakness extending across the width of the web, side-sealed bags being defined between adjacent zones of weakness and permitting individual bags to be torn off from the web at such zones of weakness; and downstream of the sealing drum, rolling the web onto a mandrel to form a film roll.

If desired, coolant may be passed through the sealing drum so as to permit the stepping up of the rate of rotation of the sealing rotor and the sealing drum and hence the sealing and cutting rate, without excessive temperatures being reached.

The perforated web downstream from the sealing drum may be guided by guide fingers spaced transversely across the width of the sealing drum and web, and spaced on either side of the web and extending downstream and defining a passage along which the web may pass on its way downstream from the sealing drum. The guide fingers may have their leading ends extending with clearance into axially spaced circumferential grooves in the sealing drum while it rotates.

The film may be drawn off the sealing drum to ensure that the film layers tightly span the slots of the sealing drum.

The drawing off of the web may be done by draw-off rollers downstream of the sealing drum. The draw off rollers may have a peripheral speed slightly greater than the peripheral speed of the sealing drum. The difference in speed may be less than one per cent. For very thin film, the speed differential may be as little as 1/20th of one percent, or even as small as 1/50th of one percent.

The web, in passing downstream from the draw-off rollers, may be guided in a downstream direction by guide fingers spaced on either side of the web to define a passage for the web. The guide fingers may have their leading ends within axially spaced circumferential grooves in the draw-off rollers.

Downstream of the draw-off rollers, the web is rolled up onto a mandrel, the rolled-up film on the mandrel engaging with slip with a drive roller driven to travel at a speed faster than the film, thereby keeping the film taut. The extent to which the peripheral speed of the drive roller travels faster than the film, may be up to about two fifths. But for very thin film, the speed differential may be less to ensure that the web does not break at a zone of weakness during rolling up of the web.

A driving torque may be applied to the mandrel so as to assist in keeping the film taut downstream from the sealing drum. The mandrel may be thrown off automatically after a pre-determined number of bags have been rolled up onto the mandrel. The throw-off of the mandrel may be triggered by a counter mechanically driven in synchronism with the sealing rotor.

The thickness of the film making up the web, may be between 4 and 100 microns. The web may wrap around the sealing drum by at least 180° and preferably by about 270° . The web may leave the sealing drum in a downward direction.

The invention extends also to apparatus for manufacturing bags from a double-layer web of synthetic plastics film, the apparatus comprising

a rotatably mounted sealing drum having a plurality of circumferentially spaced axially extending slots in its periphery;

a sealing rotor mounted to rotate about an axis parallel to the sealing drum rotary axis and having a heat cutter member with at least one heatable sealing edge having interruptions spaced along its length and adapted, in use, to enter cyclically into a slot of the sealing drum as they rotate in synchronism, and adapted to intersect a web of synthetic plastics film spanning the slot;

take-off means downstream of the sealing drum, adapted to roll up the web into a roll; and

drive means adapted to drive the sealing rotor and sealing drum in synchronism.

The apparatus may include web feed means to feed a web of synthetic plastics film in a double layer into the space between the sealing drum and the sealing rotor at a rate to match the peripheral speed of the sealing drum.

Furthermore, the apparatus may include electrical heating means, such as an electrical heating element, to heat the heat cutter member of the sealing rotor. The apparatus may include slip rings for energizing the heating element.

The sealing drum may be hollow and may have a hollow shaft with connections for leading coolant through the drum. The shaft may have an inlet connection and an outlet connection, co-axial with the rotational axis of the drum, the shaft passing through a suitable gland into the drum and out of the drum.

The take off means may include a mandrel onto which, in use, the film is rolled; and closely spaced driving rollers adapted to support the mandrel and film roll.

The drive rollers may have drive means adapted to drive them to have a peripheral speed up to two fifths faster than the peripheral speed of the sealing drum. The take-off means may include mandrel drive means adapted to drive the mandrel at a speed to keep the film taut. The mandrel drive means may include at least one belt urged into contact with the outer surface of the mandrel.

The apparatus may include an automatic mandrel throw-off mechanism, which in use is adapted to throw off the mandrel when a predetermined number of bags have been rolled up onto the mandrel. The apparatus may include a counter mechanism mechanically drivingly interconnected to run in synchronism with the sealing rotor, and to drive a cam adapted to activate the mandrel throw-off mechanism. The mandrel throw-off mechanism may include a valve operable by the cam to admit a working fluid under pressure into a cylinder within which a piston connected to a lever is displaceable, the lever upon displacement of the piston in use being adapted to throw off the mandrel to break the web downstream from the sealing roller. The cam may also be adapted to release an empty mandrel to take the place of the full mandrel thrown off.

The invention will now be described by way of example with reference to the accompanying diagrammatic drawings.

In the drawings,

Figure 1 shows an oblique rear view of apparatus according to the invention;

Figure 2 shows a side view of the passage of a web of synthetic plastics film through the apparatus;

Figure 3 shows a side view of drive chains for the various rollers of the apparatus;

Figure 4 shows a part rear view at IV-IV in Figure 6;

Figure 5 shows a part rear view at V-V in Figure 7;

Figure 6 shows a part side elevation at VI-VI in Figure 4;

Figure 7 shows a part side elevation at VII-VII in Figure 5;

Figure 8 shows a side elevation of the counter mechanism and its drive, together with the mandrel release;

Figure 9 shows a side elevation of the automatic throw-off mechanism;

Figure 10 shows a sectional plan view of the sealing rotor and sealing drum;

Figure 11 shows a fragmentary front elevation of a heat cutter member;

Figure 12 shows an underside plan view of the heat cutter member of Figure 11;

Figure 13 shows a fragmentary cross-section at XIII-XIII of the heat cutter member of Figure 11, when in position intersecting a web on a sealing drum;

Figure 14 shows a fragmentary cross-section at XIV-XIV of a web shown in Figure 15;

Figure 15 shows a fragmentary plan view of a web in the region of its zone of weakness;

Figure 16 shows a fragmentary longitudinal section at XVI-XVI in Figure 15;

Figure 17 shows a front elevation of a web in roll form when mounted about a horizontal axis;

Figure 18 shows a front elevation of a web in roll form when mounted about a vertical axis;

Figures 19 to 22 show end elevations of various types of mandrel drive means;

Figure 23 shows a part sectional rear elevation of another type of mandrel drive means; and

Figure 24 shows a side elevation of an inline film processing installation.

Referring to the drawings, reference numeral 10 refers generally to apparatus according to the invention. The apparatus comprises generally a frame 12 rotatably supporting sealing drum 14 having a plurality of circumferentially spaced slots 16 in its periphery extending axially. It also rotatably supports a sealing rotor 18 which is mounted to rotate about an axis parallel to the sealing drum rotary axis. The sealing rotor has two heat cutter members 20 and 21 having sealing edges 20.1 and 21.1 which are adapted to enter, in use, cyclically into slots of the sealing drum 14 as the sealing drum and the sealing rotor 18 rotate in synchronism. The sealing edges

20.1 and 21.1 are adapted to intersect a web 22 of synthetic plastics film as it passes over the sealing drum, and spans the slots 16 of the sealing drum 14. The sealing edges 20.1 and 21.1 have spaced interruptions and will be described more fully later.

The apparatus further comprises take-off means, generally indicated by reference numeral 24, which is mounted downstream of the sealing drum 14, and is adapted to roll the web into a roll 26 on a mandrel 28.

The take-off means comprises a roller 30 mounted immediately downstream of the sealing drum 14, guide fingers 32 and 34 downstream of the roller 30 and defining a passage for the web downstream of the sealing drum. After passing out of the passage defined by the guide fingers 32 and 34, the web 22 passes between the draw-off rollers 36 which are driven to have a peripheral speed very slightly faster than that of the sealing drum 14. The differential speed is less than one per cent, say, 1/20th to 1/50th of one percent. After leaving the draw-off rollers 36, the web 22 passes onto the roll 26 which is rolled up around the mandrel 28, by rolling on the drive rollers 38 and 40. Roller 40 is driven by roller 38 via an idler, not shown. The rollers 38 and 40 are driven to have a peripheral speed substantially faster than the speed of the web 22. The differential may be of the order of up to two-fifths faster. Substantial slippage occurs between the web and the rollers 38 and 40. The slightly faster peripheral speed of the draw-off rollers 36 relative to the sealing drum, ensures that the web is drawn tightly across the slots 16 of the sealing drum, thereby ensuring that the hot sealing edges 20.1 and 21.1 intersect and perforate the web 22 and seal off the edges of the perforations 160.1 in the web (see Figures 14 to 16). The layers of the web are thereby sealed together and side-sealed bags are formed. Adjacent bags are held together by nips or lands 160.2 between perforations 160.1, the perforations 160.1 providing zones of weakness 160 across the width of the web.

Referring to Figure 3 of the drawings, there is shown a drive chain 42 which transfers drive to the various rollers. A further drive chain 44 transfers drive to the roller 46 via its sprocket 46.1. This roller 48 serves to impart drive to the web roll 48. Instead of such roll 48, the apparatus 10 may be mounted in line with a film extruder so that the film, instead of being rolled up on a roll such as 48, proceeds directly from the haul-off of the extruder, into the apparatus 10 and onto the sealing drum 14. (See later description with reference to Figure 24.)

Referring now to Figures 4, 5, 6 and 7 of the drawings, there are shown details of the circumferential grooves 14,1 in the sealing drum 14. The grooves 14.1 are spaced axially along the length of the drum and accommodate the leading ends of thin guide fingers 32. Likewise, the leading ends of the guide fingers 34 lie within the circumferential grooves 30.1 spaced axially along the length of the roller 30. The guide fingers 32 and 34 together define a passage 35 along which the double layer web 22 passes in the direction of arrow 22.1.

Referring now to Figure 5 of the drawings, the pair of draw-off rollers 36 engage the web 22 and draw it off the sealing drum 14. They have a peripheral speed less than 1% greater than the peripheral speed of the drum 14. The speed differential may be as small as 1/50th of one percent and is preferably not larger than 1/20th of one percent. If the draw-off rollers 36 travel at too fast a rate, then there may be a tendency for the web to break at the zones of weakness. Accordingly, it is important to have the peripheral speeds of the draw-off rollers 36 matched to that of the sealing drum 14, to maintain the integrity of the web until it is rolled up into the roll 26. The draw-off rollers 36 also have circumferential grooves 36.11 and 36.21 spaced axially along the lengths of the rollers 36.1 and 36.2. Within

these circumferential grooves there are provided guide fingers 37.1 and 37.2 which have their leading ends extending into the grooves 36.11 and 36.21. These guide fingers ensure that the web 22 travels beyond the rollers in the direction of arrow 22.1, without rolling up onto the rollers 36.1 and 36.2.

Referring now to Figures 8 and 9 of the drawings, there is shown the counter mechanism, generally indicated by reference numeral 50 and its interconnection with the mandrel release mechanism, generally indicated by reference numeral 52 and the automatic throw-off mechanism, generally indicated by reference numeral 54 (see Figure 9). The counter mechanism is driven from a gear 14.2 fast and co-axial with the sealing drum 14. The gear 14.2 engages with a toothed gear wheel 18.1 co-axial with and fast with the sealing rotor 18. A toothed sprocket 56 is co-axial with the sealing rotor shaft 57 and drives a sprocket 58 via a chain 60. The sprocket 58 is mounted on the input shaft of a speed reducer in the form of a gearbox 62 whose output shaft 64 drives a worm speed reducer 66 on whose output shaft there is mounted a cam 68 having a lobe which will engage cyclically with a limit switch 70. The limit switch, when operated, energizes a solenoid valve 72 which, when operated, admits air under pressure to a cylinder 74 which operates a lever 76 to release a mandrel 28 which falls into the nip region between the rollers 38 and 40 which are rotated in the direction indicated by the arrows, thereby causing the web 22 to roll up on to the mandrel 28 in the direction indicated by the arrows.

When the roll is full, as indicated by reference numeral 26, then a predetermined number of bags will have been rolled up on the roll, having been mechanically counted and corresponding to the number of revolutions made by the sealing drum 14 and the sealing rotor 18. When the predetermined number of bags has been reached,

then the lobe on the cam 68 operates the limit switch 70. Closure of this switch 70 also operates the automatic throw-off 54 and does so via the leads 80 which energize a solenoid valve 82 which admits compressed air into the cylinder 84 to pull the arm 86 in the direction of arrow 88, thereby causing the transversely spaced arms 90, via chain 91, to move in the direction of arrow 92 (see also Figure 1). The bars 94 fast with the arms 90 bear against the opposing ends of the mandrel 78, and throw off the full roll 26 into the tray 96. At the same time, the mandrel release mechanism 52 will also have been operated, as described above, and a fresh unfilled mandrel 28 is released by the mandrel release mechanism 52. The mandrel 28 then drops under gravity into the nip region of the rollers 38 and 40. On the return stroke of the arms 90, the lower ends of the bars 94 pass over the ends of the mandrel which now lies low within the nip region of the rollers 38 and 40.

Referring now to Figure 10 of the drawings, there is shown a sectional plan view of the sealing drum 14 and the sealing rotor 18. The sealing rotor 18 has two heat cutting members 20 and 21 having sealing edges 20.1 and 21.1. The sealing edges 20.1 and 21.1 engage alternately with the slots 16 of the sealing drum 14. In Figure 10, the heating edge is shown in engagement with a slot of the sealing drum 14. The sealing edges 20.1 and 21.1 are heated by electric heating elements 102 and 104, energized via slip rings 106 and brushes 108. The sealing rotor 18 is mounted on a shaft 110 rotatably supported in bearings 112.

The sealing drum is mounted rotatably on a hollow shaft 14.3 via bearings 114 and is driven via chain 42 and sprocket 116. The drum 14 is hollow and is fed via the hollow shaft 14.3 with cooling water via glands 118 and 120.

Further details of the sealing edges 20.1 and 21.1 and the perforations made in the web, will become apparent from Figures 11 to 18.

Referring to Figures 11, 12 and 13 of the drawings one of the heat cutter members, namely 21, is shown in greater detail. It has a heating cutting and sealing edge 21.1 which, when hot, will intersect and seal the web 22 as it lies on the sealing drum 14. The hot cutting edge 21.1 will pass through the web 22, and enter a slot 16. The cutting edge 21.1 is provided with interruptions 21.2. The length of an interruption 21.2 in the cutting edge 21.1, may be of the order of a few millimetres, say, one or two millimetres. The distance between interruptions may vary from about 20 mm to about 100 or 150 mm. The total length of the interruptions may thus be of the order of less than 1% to 10% of the total length of the heating cutting edge of the heat cutter member 20 or 21.

Referring now to Figures 14, 15 and 16 of the drawings, there are shown details of a double-layer web 22 of synthetic plastics material, after a zone of weakness has been provided in it. When one of the hot cutting sealing edges 20.1 and 21.1 of the heat cutter members 20 and 21 intersects the web 22, a zone of weakness 160, extending transversely to the direction of movement of the web through the apparatus 10, is provided. The zone of weakness 160 is constituted by a plurality of perforations 160.1 separated by lands 160.2 holding adjacent panels 22.1 and 22.2 together. These panels are separated by the zone of weakness 160. The lands 160.2 are provided by the interruptions 21.2 in the cutting edge of the heat cutter member 21. The cutting edge 21.1 of the heat cutter member 21, at the interruptions 21.2, are provided with sharp edges so as to ensure that the lands 160.2 between adjacent perforations 160.1, will have waists. This will ensure that the panels will separate at the waists, along the zone of weakness, when pulled apart (see Figure 15).

The upper and lower layers 22.11 and 22.12 of a panel 22.1 will become fused together at the zone 162 in the perforation 160.1. When in operation, the heat cutter members 20 and 21 will be maintained at a suitable temperature in order to ensure effective cutting of the web, and effective welding of the upper and lower layers 22.11 and 21.12, and of corresponding layers of other panels. The heat cutter sealing members 20 and 21 will be electrically heated, as described above with reference to Figure 10.

Referring now to Figures 17 and 18 of the drawings, after the web has been taken up in roll form 26, as indicated in Figures 1 and 2 of the drawings, the roll 26 is removed and is mounted as shown in Figure 11 or 12 of the drawings, for use. The roll 26 may be mounted to be rotatable about the axis of the mandrel 28, the various panels 22.1, 22.2 and 22.3 being separated by zones of weakness 160. The zones of weakness are provided by a series of perforations 160.1 spaced across the width of the web 22. The perforations are separated by the lands 160.2. The web in roll form 26 is in a double layer folded over at the longitudinal edge 26.11, and is open at the longitudinal edge 26.21. The edge 26.21 of one layer extends transversely beyond the longitudinal edge 26.22 of the other layer of the roll 26.

Figure 18 shows an alternative way of mounting the roll 26. In this embodiment, the roll 26 is mounted about the axis of a rod 172 fast with a base 174 resting on a support 176.

The automatic throw-off of the rolls 26 when full, and the automatic feed of a new mandrel, makes possible the supervision of a number of machines by one operator who is required to remove rolls 26 and to provide a supply of mandrels at infrequent intervals only.

In practice, where a machine is of substantial width, it will be possible to have a plurality of rolls 48 processed at the same time for the production of rolls 26. The rolls 26 will then be produced side-by-side.

Referring now to Figures 19 to 22 of the drawings, there are shown end elevations of various types of mandrel drive means generally indicated by reference numeral 200. The mandrel drive means of Figure 19, comprises a drive pulley or sprocket 202 driven by a belt or chain 204. The wheel 202, drives a pulley co-axial with it, which carries a belt 206 running over a pulley 208, mounted rotatably on an arm (not shown) mounted to pivot about the rotational axis of the wheel 202. The belt 206 passes over a jockey pulley 210 and in doing so, runs in contact with the mandrel 28 on which the web 22 has been rolled into a roll 26. When the belt 206 runs in the direction indicated by the arrows, it imparts a driving torque to the mandrel 28.

Referring now to Figure 20 of the drawings, there is shown a similar arrangement having a driven pulley 208 at the end of an arm not shown, which is mounted to pivot about the axis of the wheel 202. The pulley 208 is, however, adapted to drive another pulley co-axial therewith. Such other pulley carries a belt 206.1 which in turn, when it runs over deflection pulleys 212 and 214, runs in contact with the mandrel 28 to impart a torque thereto.

Referring now to Figure 21 of the drawings, the drive roller 40, has fast and co-axial with it, a pulley 216, carrying a belt 206.2 which runs over a pulley 218 on an arm not shown but which is mounted to pivot about the axis of the pulley 216.

Referring now to Figure 22 of the drawings, the arrangement is similar to that shown in Figure 19, excepting that the arm carrying the pulleys 202 and 208, is a leading arm relative to the direction of travel of the web 22, instead of being a trailing arm as shown in Figure 19. In other respects, the method of operation is the same.

Referring now to Figure 23 of the drawings, the mandrel drive means 200 comprises a final drive 207 to the mandrel 28, which is similar to that shown in Figure 20 of the drawings in having three pulleys. However, instead of the final drive 207 being mounted at the end of a trailing arm, it is rather mounted on a cross head 220, mounted to slide vertically along a vertical guide 222 so as to keep the belt 206.3 in contact with the mandrel, as it rises when the roll 26 increases in diameter, as the film rolls up on the roll 26. Power to the final drive 207, is provided by a belt 224 which drives a right angle drive 228 driving a shaft 230, having splines 232. Drive from the splines 232, is transmitted via a right angle drive generally indicated by reference 234 to the pulley 236 which carries the belt 206.3 running in contact with the mandrel 28.

The belts 206, 206.2 and 206.3, in running in contact with the mandrel 28, impart torque to it to assist in the rolling up of the film in the form of a roll 26.

Referring now to Figure 24 of the drawings, there is shown diagrammatically in side elevation an in line installation generally indicated by reference numeral 240. It comprises generally an extruder 242 extruding synthetic plastic film in tubular form 244 drawn off by rollers 246. If desired, the film web 22 may pass through slitting and deblocking equipment 248 then through printing equipment 250 before it finally enters the side seal bag making machine 10 as already described. It will

be noted from Figure 24 of the drawings, that the web 22 wraps around the sealing drum 14, to an extent of about 270°. This ensures that there is good contact between the drum and the web 22, and that the web spans the slots 16 of the drum tightly, thereby resulting in good and effective welding of the web taking place along the edges of the perforations forming the zones of weakness. The drum 14 and its associated rollers will be driven in synchronism with the upstream printing installation and the extruder.

In the installation of Figure 24, the roller 38 co-acts with the roller 36 and functions as draw-off rollers driven to have peripheral speeds at most one percent faster than the linear speed of the web 22. In this installation, the roller 40 may be driven independently of roller 38 to have a peripheral speed of up to two-fifths faster than the linear speed of the web 22.

The circumferential lap of the web 22 around the sealing drum upstream of the sealing rotor is about 90°. This is to keep the roller 17 away from the sealing rotor so as to prevent overheating of the roller 17. Downstream of the sealing rotor, the circumferential lap of the web around the sealing drum is preferably in excess of 90°, up to about 180°. This is to ensure that the seals will have sufficient time to cool and for the welds to set, before the web leaves the sealing drum 14.

The Applicant has found that side-sealed plastic bags can have adequate strength for most purposes, for example, for the packing of merchandise in shops. The Applicant has also found that for most purposes the bags do not have to be airtight. Indeed, for some purposes it is advantageous if they are not airtight.

Accordingly, bags made in accordance with the invention can be utilized in roll form, adjacent bags being held together by the holding lands 160.2. Bags can easily be torn from the roll, separation between adjacent bags taking place along the zones of weakness 160.

The film used is conveniently low density polyethylene film. The bags are easily opened by having one lip 26.22 longer than the other lip 26.21.

Film having a thickness of between 4 microns and 100 microns can be processed in accordance with the invention. Besides, low density polyethylene film, film of other materials, can also be processed in the manner according to the invention. Thus, polypropylene film, high density polyethylene film, rigid polyvinylchloride film, ie without plasticiser, can all be processed in the manner as described.

The use of a rotating sealing rotor and a cooled sealing drum makes possible the economic high-speed production of side-sealed bags in roll form from thin film. Production of bags from thin film in accordance with the invention, can take place at a rate of about 500 bags per minute.

The linear speed of film from an extruder is much greater when extruding thin film than when extruding thick film. Accordingly, the bag-making machine according to the invention, with its capacity of high production rate of bags from thin film, makes possible its arrangement in line with and downstream from an extruder.

When the driving motor of a machine 10 is provided with stepless speed control gear, then the machine 10 can be usefully used in line with an extruder extruding thin film. The rate at which the web 22 passes through the machine 10 may then be accurately adjusted to match the extrusion rate of the extruder when it is producing thin film of the desired quality at its optimum rate. Such an installation is particularly well adapted to process film having a thickness in the range 4 to 30 microns.

CLAIMS:

1. A method of manufacturing bags from a double layer web (22) of synthetic plastics film, characterized in that it includes

running the web (22) in contact with the surface of a rotating sealing drum (14) having a plurality of axially extending circumferentially spaced slots (16);

running a sealing rotor (18) in synchronism with the sealing drum (14), the sealing rotor (18) having a heat cutter member (20,21) with at least one hot sealing edge (20.1,21.1) having interruptions (160.2) spaced along its length, the sealing edge (20.1,21.1) cyclically entering a slot (16) of the sealing drum (14) and intersecting the layers of the film (22) and perforating them at spaced intervals along the length of the sealing edge and across the width of the web (22) and sealing the two layers of film together at such perforations (160.1), which thereby provide longitudinally spaced transverse zones of weakness (160) extending across the width of the web (22), side-sealed bags 22.1, 22.2, 22.3) being defined between adjacent zones of weakness (160) and permitting individual bags to be torn off from the web (22) at such zones of weakness (160); and downstream of the sealing drum (14), rolling the web (22) onto a mandrel (28) to form a film roll (26).

2. Apparatus for manufacturing bags from a double-layer web (22) of synthetic plastics film, characterized in that the apparatus comprises

a rotatably mounted sealing drum (14) having a plurality of circumferentially spaced axially extending slots (16) in its periphery;

a sealing rotor (18) mounted to rotate about an axis parallel to the sealing drum rotary axis and having a heat cutting member (20,21) with at least one heatable sealing edge (20.1, 21.1) having interruptions (160.2) spaced along its length and adapted, in use, to enter cyclically into a

slot (16) of the sealing drum (14) as they rotate in synchronism, and adapted to intersect a web (22) of synthetic plastics film spanning the slot (16);

take-off means (24, 26, 38, 40) downstream of the sealing drum (14), adapted to roll up the web (22) into a roll (26); and

drive means (18.1, 14.2) adapted to drive the sealing rotor (18) and sealing drum (14) in synchronism.

3. Apparatus as claimed in Claim 2, characterized in that the sealing drum (14) has a hollow shaft (14.3) having suitable glands (113, 120) for passing a liquid coolant through the shaft and sealing drum.

4. Apparatus as claimed in Claim 2 or Claim 3, characterized in that the take-off means (24, 28, 40) includes

a mandrel (28) onto which, in use, the film is rolled; and

closely spaced drive rollers (38,40) adapted to support the mandrel (28) and film roll (26).

5. Apparatus as claimed in Claim 4, characterized in that the drive rollers (38, 40) have drive means (42) adapted to drive them to have a peripheral speed faster than the peripheral speed of the sealing drum.

6. Apparatus as claimed in Claim 4 or Claim 5, characterized in that the take-off means (24) includes mandrel drive means (200) adapted to drive the mandrel (28) at a speed to assist in keeping the film taut.

7. Apparatus as claimed in Claim 6, characterized in that the mandrel drive means (200) includes at least one belt (206, 206.1, 206.2, 206.3) urged into contact with the outer surface of the mandrel (28).

8. Apparatus as claimed in any one of Claims 4 to 7 inclusive, characterized thereby that there is provided an automatic mandrel throw-off mechanism (54), which in use is adapted to throw off the mandrel (28) when a predetermined number of bags have been rolled up onto the mandrel (28).

9. Apparatus as claimed in Claim 8, characterized in that it includes a counter mechanism (50) mechanically drivingly interconnected to run in synchronism with the sealing rotor (18), and to drive a cam (68) adapted to activate the mandrel throw-off mechanism (54).

10. Apparatus as claimed in Claim 9, characterized in that the mandrel throw-off mechanism (54) includes a valve operable by the cam (68) to admit a working fluid under pressure into a cylinder (84) within which a piston connected to a lever (90) is displaceable, the lever (90) upon displacement of the piston in use being adapted to throw off the mandrel (28) to break the web (22) downstream from the sealing roller (14).

11. Apparatus as claimed in Claim 10, characterized in that the cam (68) is also adapted to release an empty mandrel (28) to take the place of the full mandrel (28) thrown off.

12. An inline bag-making installation, characterized in that it includes

an extruder for extruding thin synthetic plastics film in tubular form, the film having a thickness of 4 to 100 microns; and

in line and downstream therefrom, apparatus as claimed in any one of Claims 2 to 11 inclusive.

13. An installation as claimed in Claim 13 and which includes speed control means for varying the speed of the drive means of the apparatus.

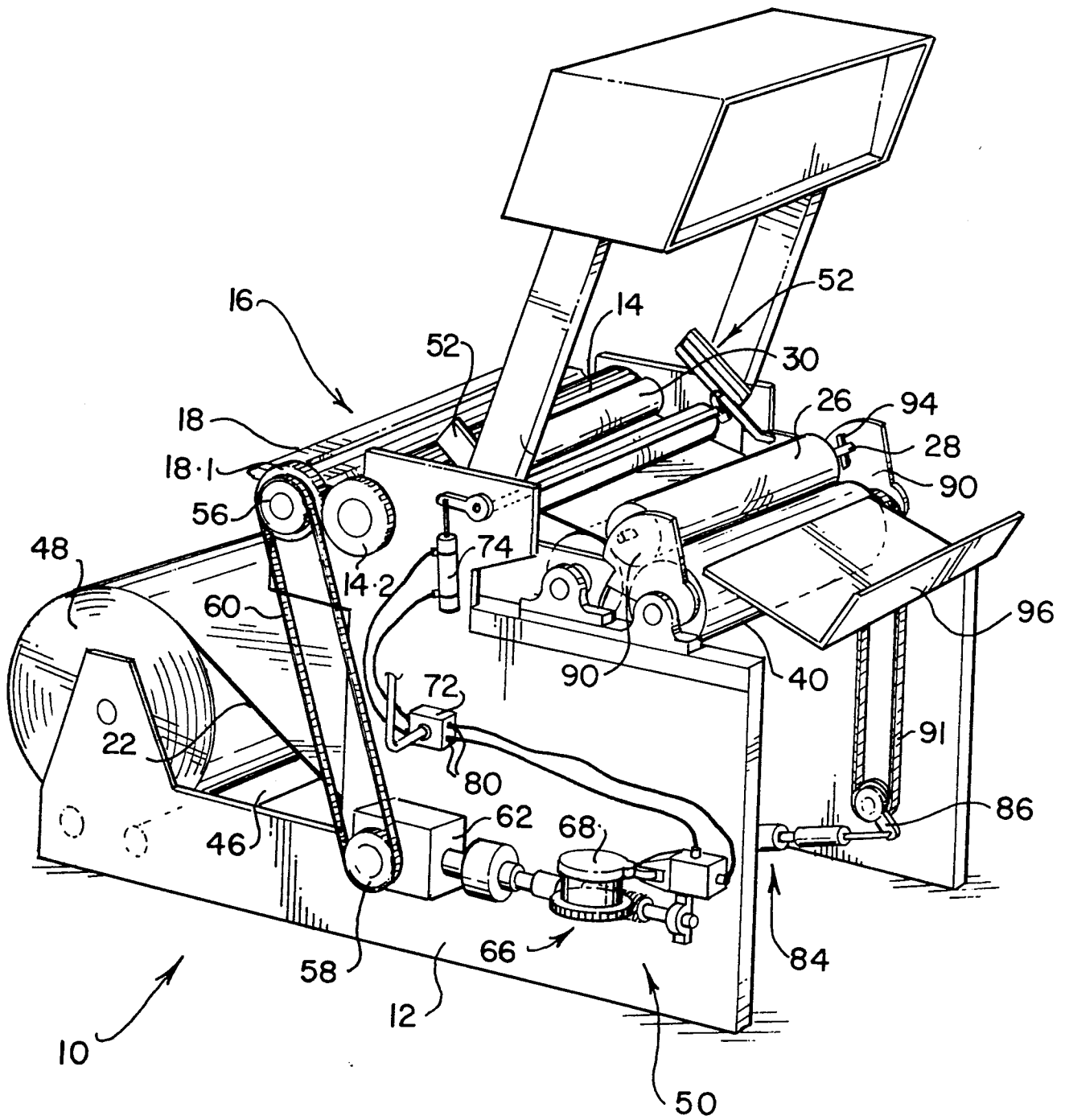


FIG. 1

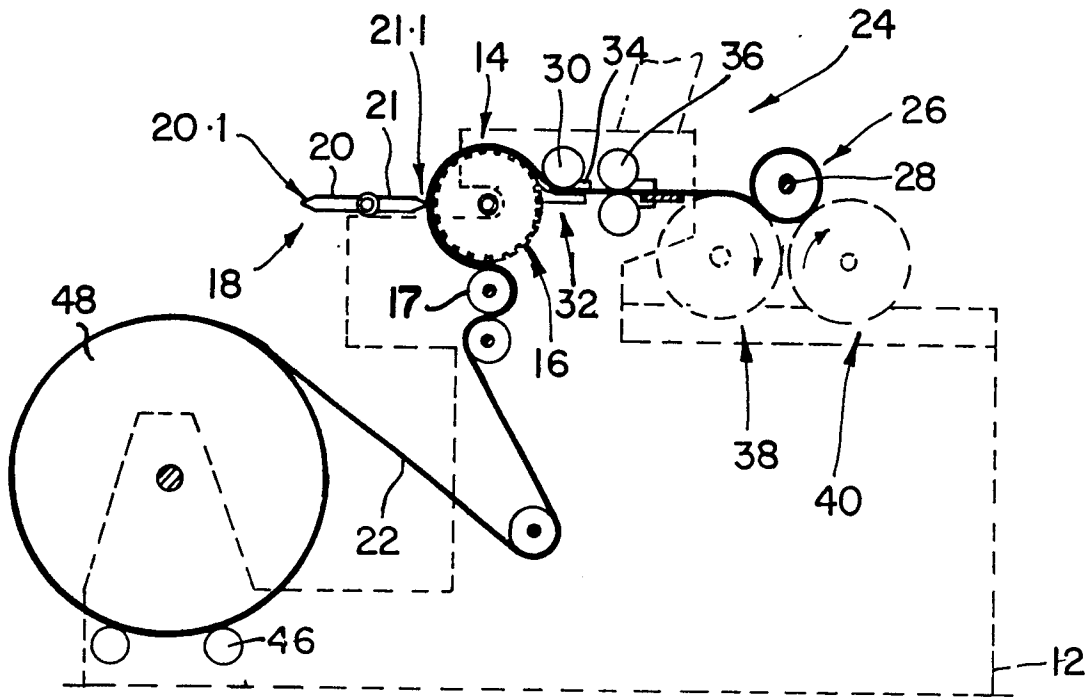


FIG. 2

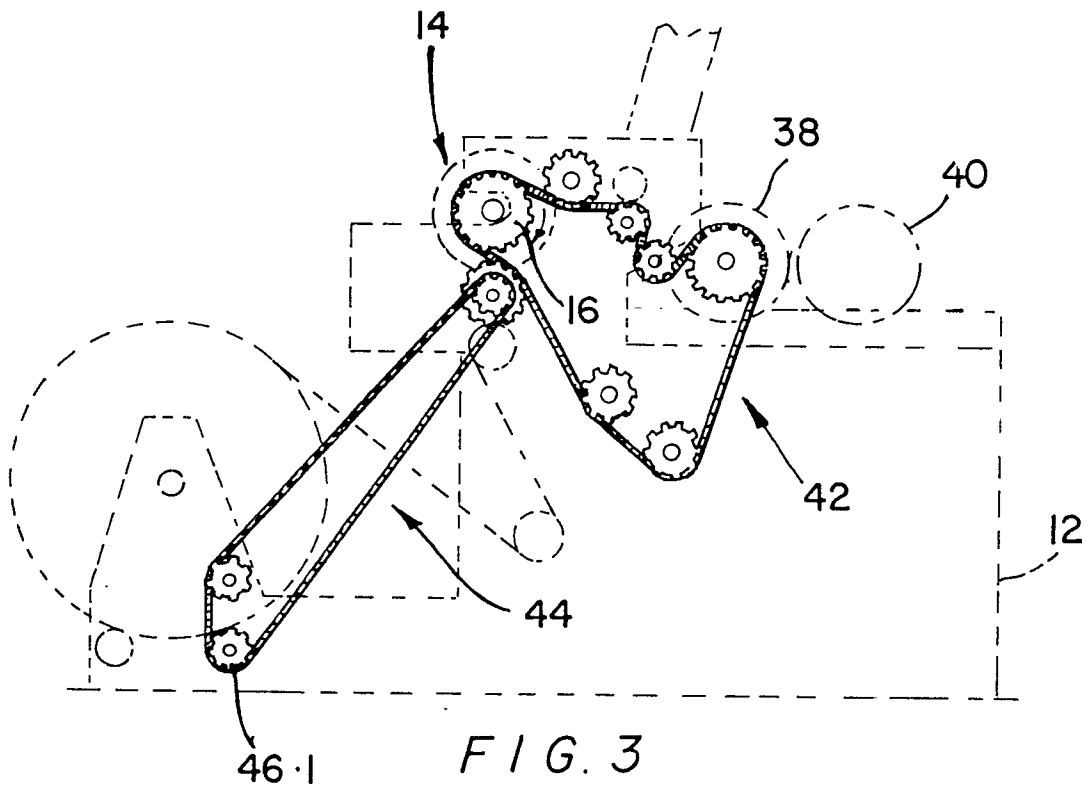


FIG. 3

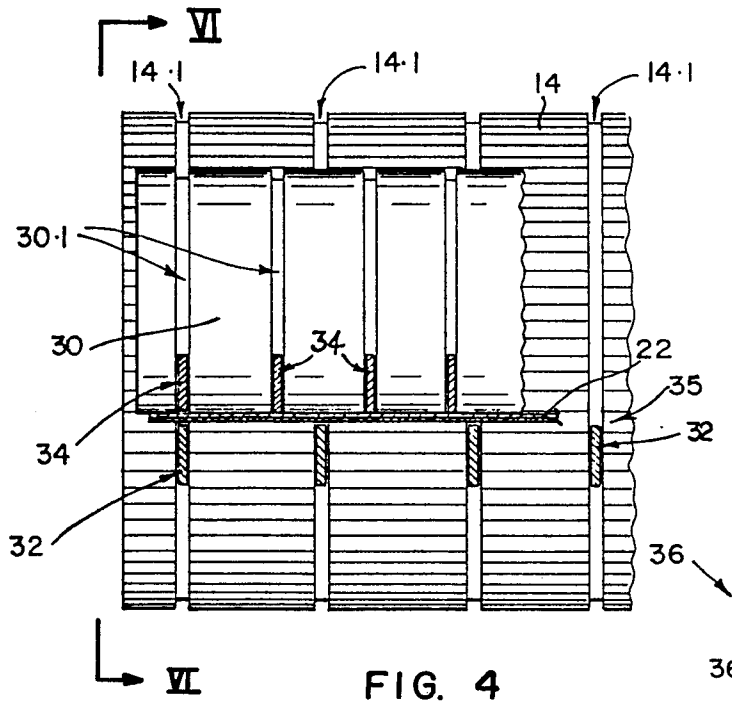


FIG. 4

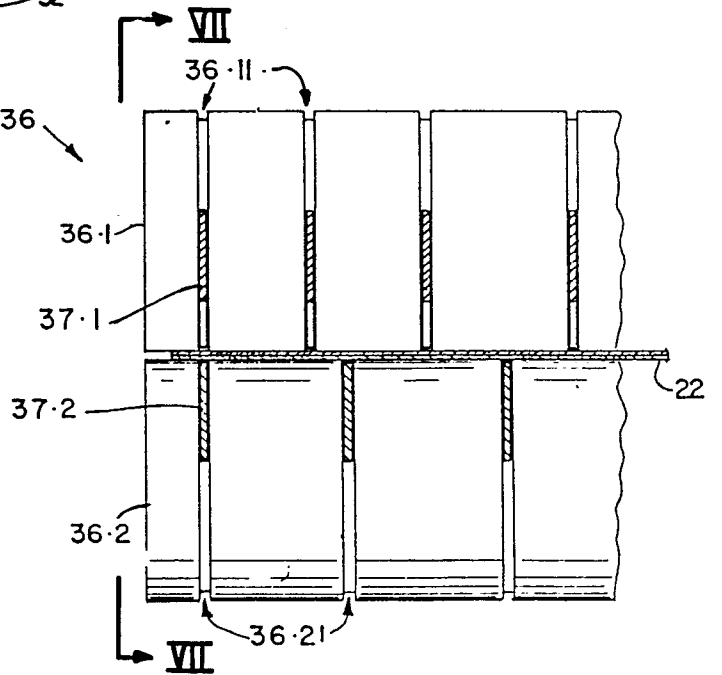


FIG. 5

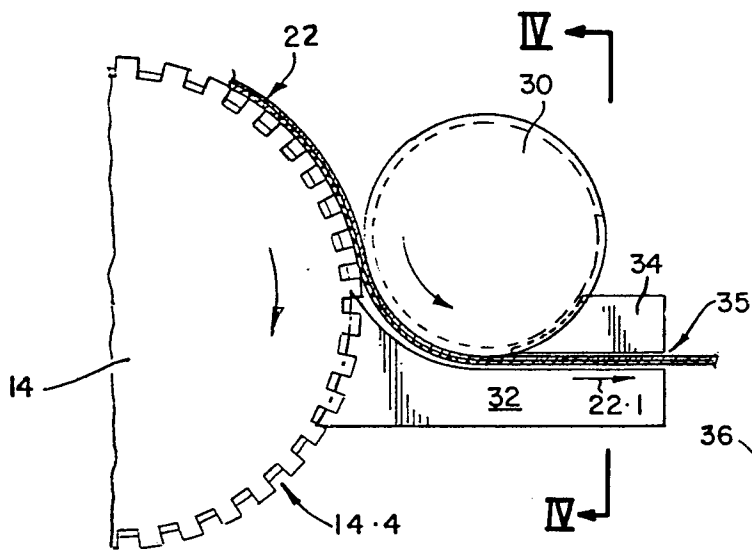


FIG. 6

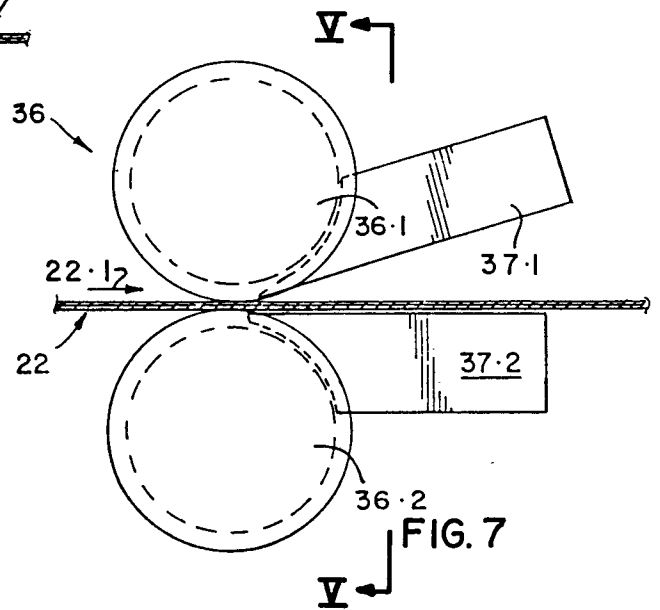


FIG. 7

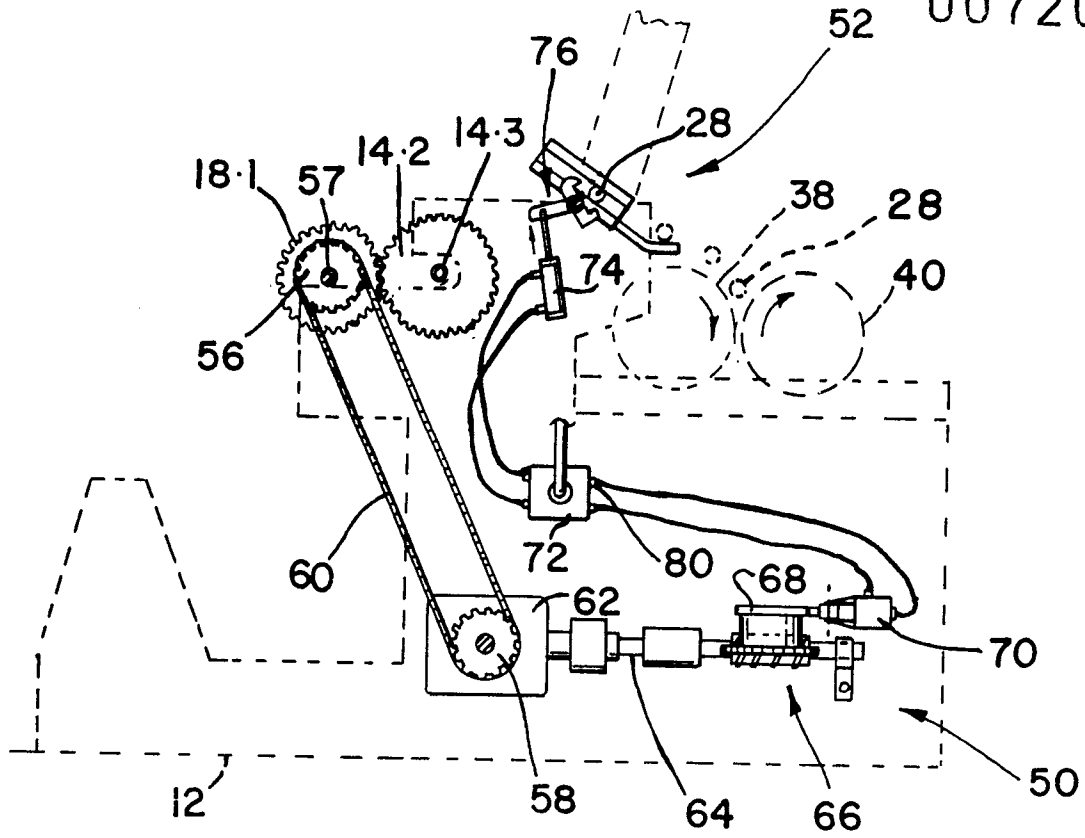


FIG. 8

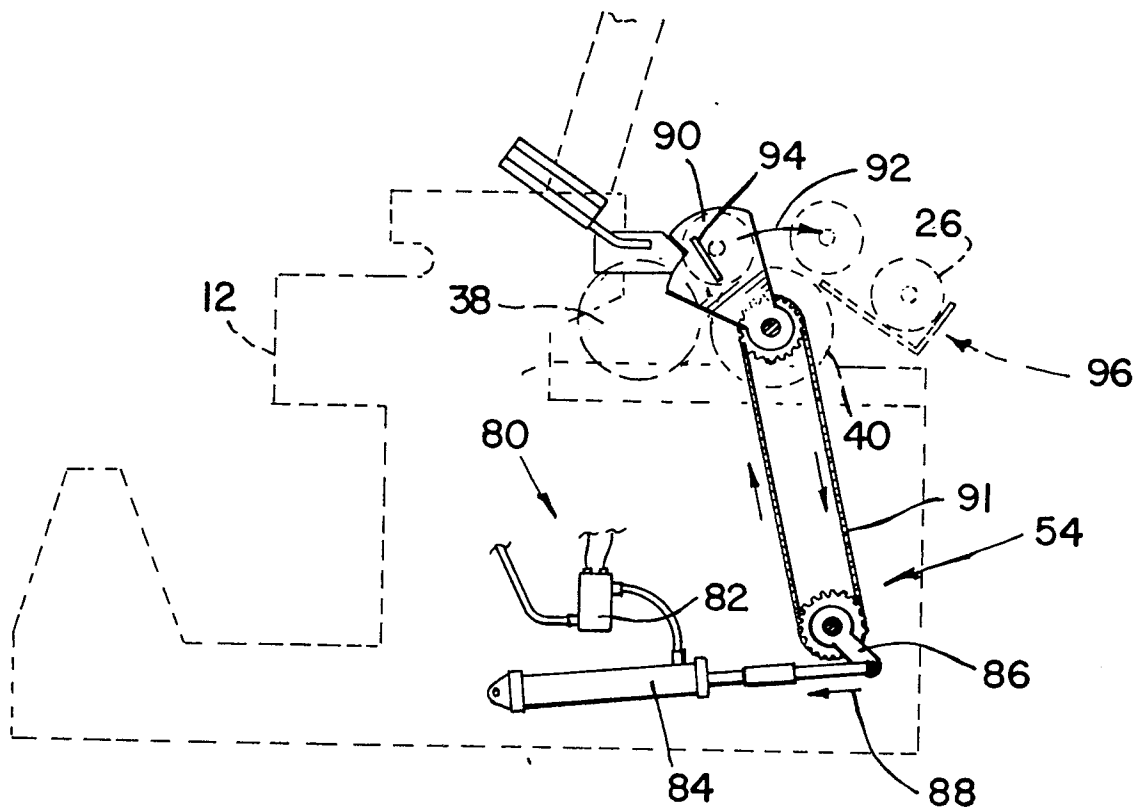
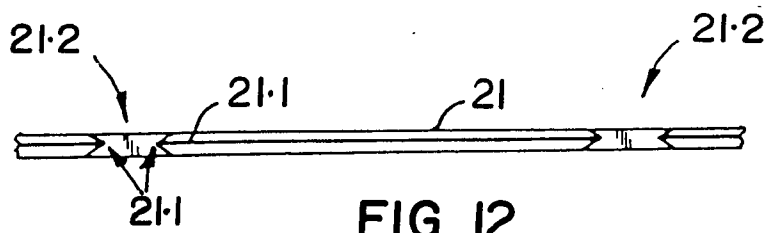
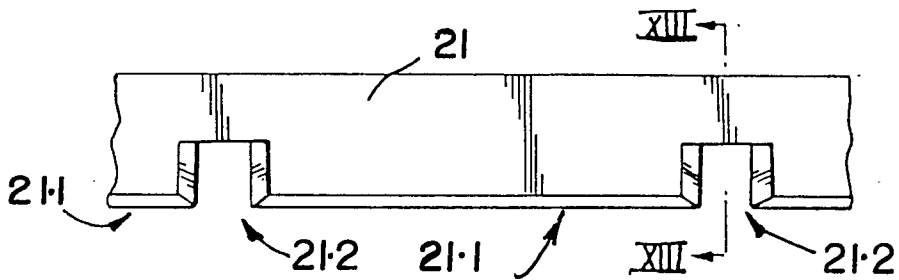
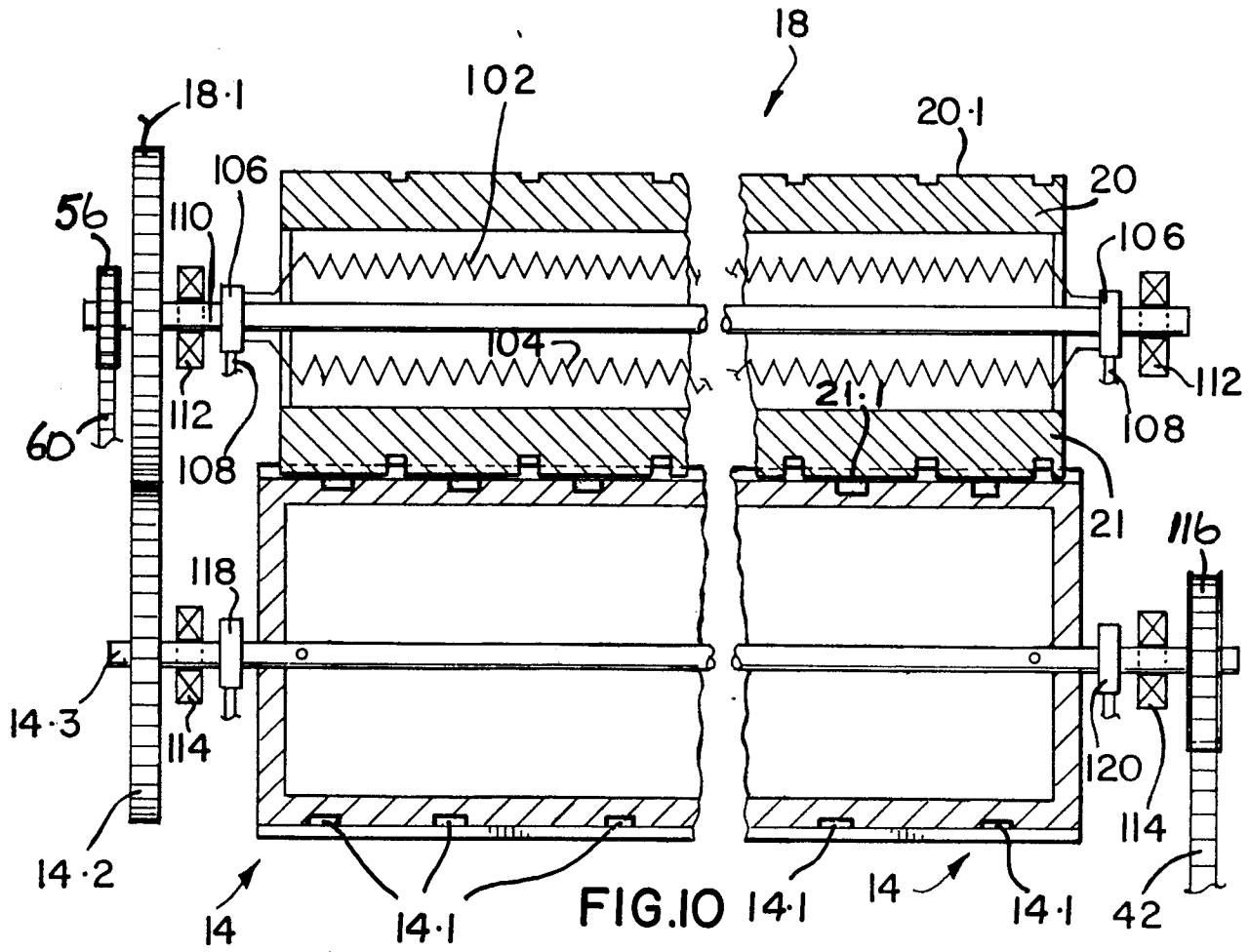


FIG. 9



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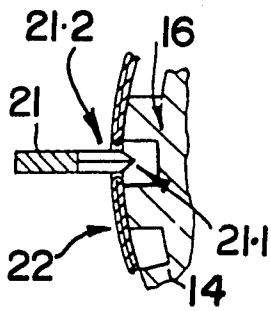


FIG. 13

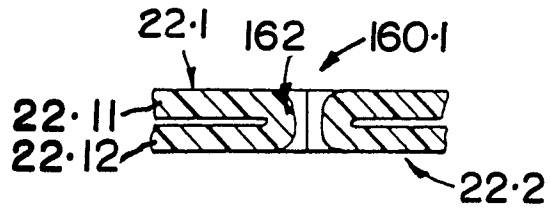


FIG. 14

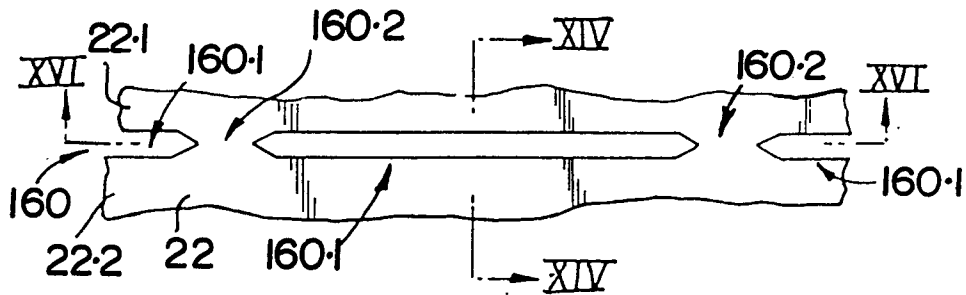


FIG. 15

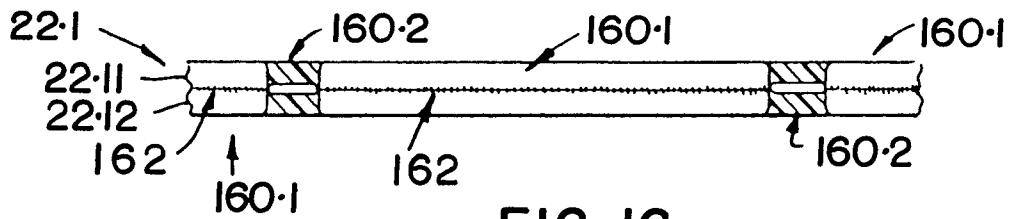


FIG. 16

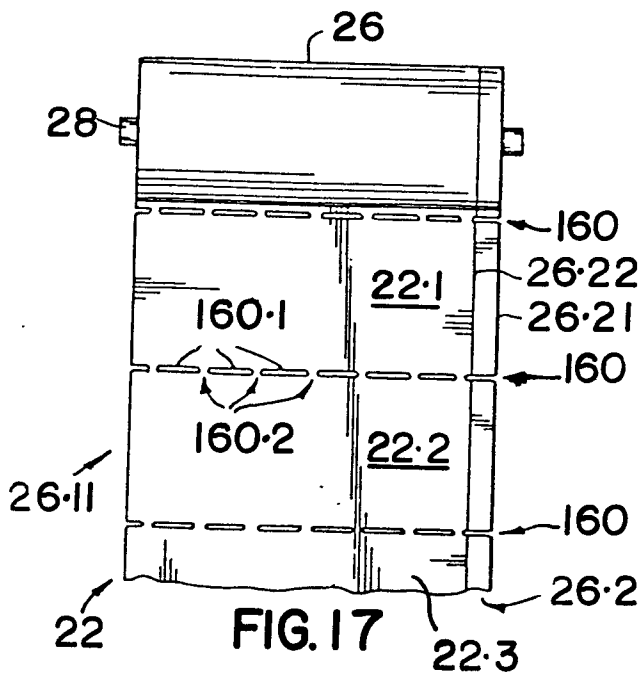


FIG. 17

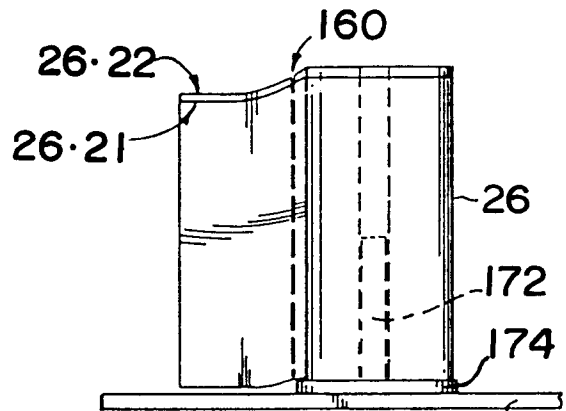


FIG. 18

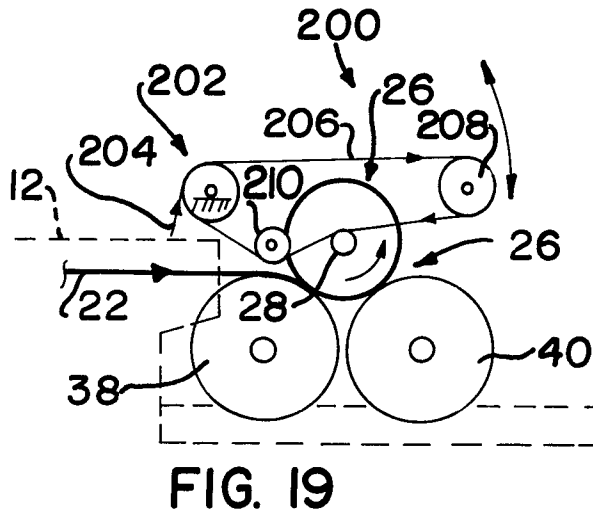


FIG. 19

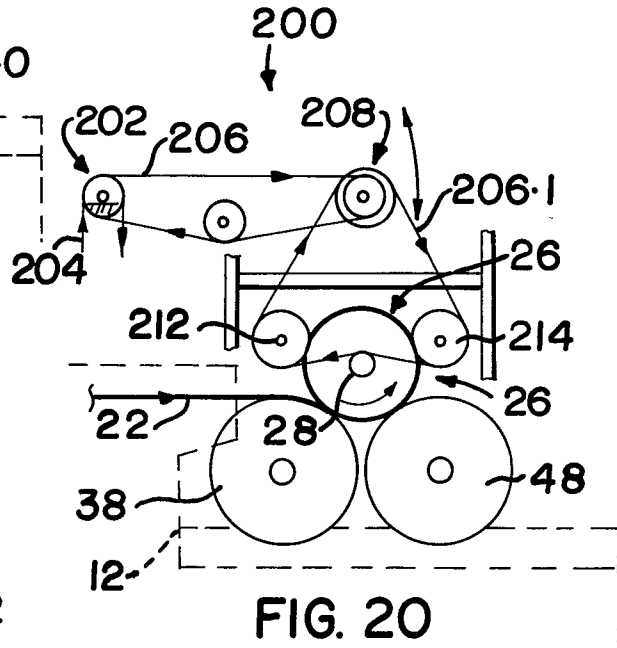


FIG. 20

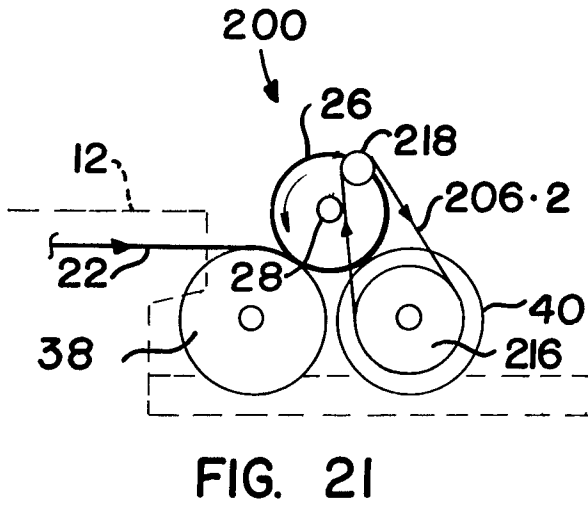


FIG. 21

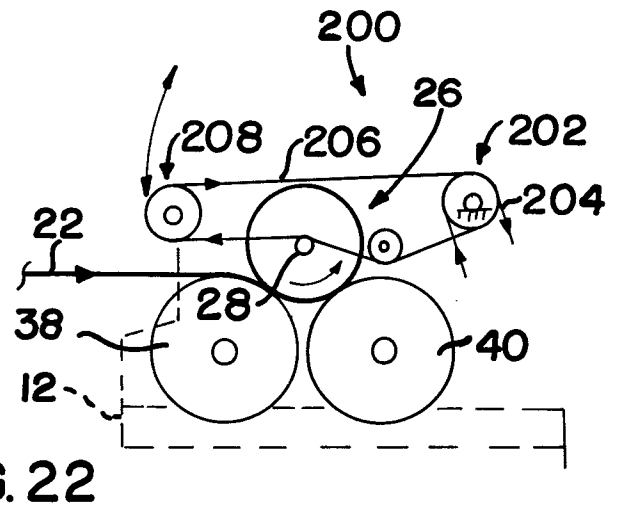


FIG. 22

