



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
17.09.2003 Bulletin 2003/38

(51) Int Cl.7: **B65H 19/22, B65H 18/10**

(21) Application number: **02425144.9**

(22) Date of filing: **12.03.2002**

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE TR**
Designated Extension States:
AL LT LV MK RO SI

(72) Inventor: **Rizotti, Paolo**
28100 Novara (IT)

(74) Representative: **Petruzzello, Aldo**
Racheli & C. S p A
Viale San Michele del Carso, 4
20144 Milano (IT)

(71) Applicant: **Bielloni Castello S.p.A.**
20046 Biassono (Milano) (IT)

(54) **Winder for film of plastic material**

(57) A winder (1) for film of plastic material comprises drawing assemblies for feeding the film (3) towards a winding zone wherein the film is wound on at least one pair of cores (10) supported by a spindle (8) rotated around its own axis, for the formation of rolls (80); spindle support means for supporting the spindle (8) in said winding zone; pressure control means (11, 25) for controlling the pressure of the film (3) on the roll (80) being formed during winding and during the changeover phase; spindle loading means (30, 40) suitable for loading a spindle with empty cores (10) from a magazine

(60) to the winder; spindle unloading means (20) suitable for unloading the spindle with the formed rolls from the winder (1) to the magazine (60); and cutting means suitable for cutting transversely the film (3) once at least one roll (80) has been completed on the spindle (8) which has to be unloaded towards the magazine (60); the spindle support means comprising at least two cradles (9) mounted fixed in the shoulders (2) of the frame of the machine, and said pressure control means comprising at least one roller (14, 25) mounted movably so as to adjust to the increase in diameter of the roll (80) being formed in the winding zone.

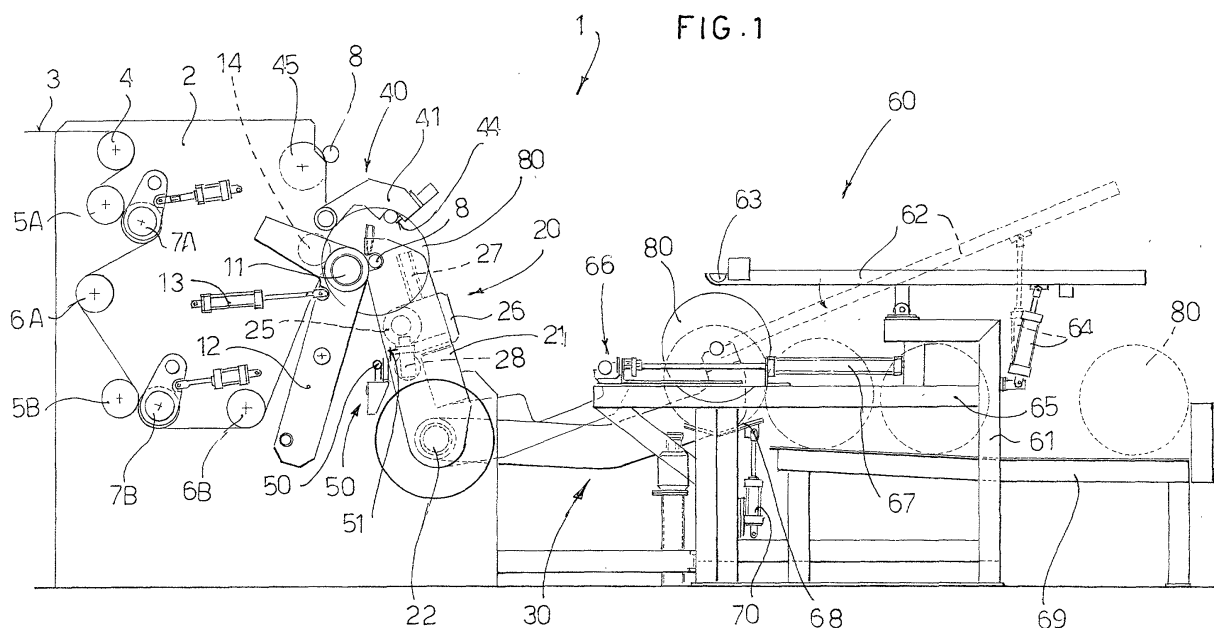


FIG. 1

Description

[0001] The present invention relates to a winder for film of plastic material.

[0002] Winders are generally used for winding material in films, webs or layers on cores so as to obtain rolls of sheet material suitable for sale. For this reason winders are generally positioned downstream of an extrusion assembly so as to wind the film coming out of an extrusion head.

[0003] Currently two types of winders are known: turret winder and contact winder.

[0004] The turret winder, also known as carousel or revolver winder, has a rotating cage with horizontal axis which supports peripherally at least two spindles or mandrels (one in a loading position and the other in a winding position) whereon the cores for winding are inserted. When the spindle is in the winding position, it is rotated around its own axis so as to wind the film onto the cores in order to form the rolls. During winding a pressure roller or compactor roller is in contact with the roll being formed, so as to control the pressure on the film, preventing air from entering the gaps between the turns of the film which is wound on the roll. The pressure roller moves so as to adapt to the growth in diameter of the roll being formed.

[0005] Having completed formation of the rolls, the changeover step takes place wherein the cage is rotated around its own axis and a new spindle, preloaded with empty cores, moves from the loading position to the winding position, while the spindle with the completed rolls moves from the winding position to an unloading position wherein the rolls are ready to be unloaded from the winder. During this changeover step, the pressure roller moves away from the almost formed rolls and the film is cut so as to be wound on the new cores.

[0006] This turret winder has the disadvantage that, during the changeover step, the pressure roller detaches from the rolls being formed, and consequently the pressure on the last turns of the roll is not controlled, with the result of having rolls with film wound irregularly, jeopardising the actual quality of the film.

[0007] This disadvantage has been solved in part by providing a second pressure roller which intervenes during the changeover step so as to accompany the formed roll from the winding position to the unloading position.

[0008] In any case the turret winder has disadvantages from the viewpoint of production rate which cannot be increased beyond a certain limit. By increasing the speed of rotation around the axis of the spindle, the critical speed is reached at which the spindle starts to vibrate. On the other hand it is somewhat complex to provide an adequate spindle stabilisation system on the rotating cage.

[0009] Moreover the turret winder has constructional and structural difficulties due to the high inertial masses to be moved during rotation of the cage for the spindle change. Furthermore the turret winder is weighed down

by the use of motors electrified by a brush collector and mounted integrally on the cage for rotation of the spindle during winding. Moreover the use of other types of motors is inadequate due to the wiring to the relative drives which would obstruct rotation of the cage.

[0010] The contact winder has a motorised drum rotating around its own horizontal axis. A spindle with the cores preloaded is taken from a loading position to a winding position wherein the cores are in contact with the drum which, by rotating, causes winding of the film on the cores for the formation of the rolls. During winding the drum remains fixed in position and the spindle is supported by a mobile support so as to move into position to adjust to the increase in diameter of the roll being formed. Once the roll has been completed, the spindle is moved into a roll unloading position and a new spindle with preloaded cores is taken into the winding position.

[0011] The contact winder has the main disadvantage of not allowing adequate control of the pressure on the roll during winding. In the changeover step, when a new spindle is taken from the loading position to the winding position, there is no control of pressure on the roll. Consequently the first turns of the roll risk having imperfections which will affect the entire roll.

[0012] An object of the present invention is to eliminate the disadvantages of the prior art, by providing a winder for film of plastic material which is extremely efficient and capable of allowing a high production speed.

[0013] Another object of the present invention is to provide such a winder for film of plastic material which is capable of guaranteeing high quality of the rolls produced.

[0014] Yet another object of the present invention is to provide such a winder for film of plastic material which has a simple and compact structure, at the same time stable and secure.

[0015] These objects are achieved in accordance with the invention with the features set forth in appended independent claim 1.

[0016] Advantageous embodiments of the invention are disclosed by the dependent claims.

[0017] The winder for film of plastic material according to the invention comprises:

- drawing assemblies for feeding the film towards a winding zone wherein the film is wound on at least one core supported by a spindle suitable to rotate around its own axis for the formation of rolls,
- spindle support means for supporting and stiffening the spindle in the winding zone,
- pressure control means for controlling the pressure of the film wound on the roll being formed during winding,
- spindle loading means suitable for loading a spindle with empty cores from a magazine to the winder, maintaining the spindle fixed in a working position,
- spindle unloading means suitable for unloading the spindle with the rolls formed from the winder to the

magazine, and

- cutting means suitable for cutting the film transversely once the roll on the spindle which has to be unloaded to the magazine has been completed.

[0018] In particular the spindle support means comprise at least two cradles mounted fixed in the shoulders of the frame of the machine, and another three cradles (two lateral and one central) positioned on respective connecting-rods, and the pressure control means comprise at least one roller mounted movably so as to follow the increase in diameter of the roll being formed in the winding zone.

[0019] This type of solution has the advantage of having a spindle rotatably mounted in the shoulders of the frame of the machine and therefore maintained fixed in position, throughout winding. However the pressure control means move during winding to adjust to the growth in diameter of the rolls.

[0020] The advantages of the present invention are clear from this description. This solution not only allows high stabilisation of the spindle so as to have high speeds of rotation of the spindle during winding, but also allows the pressure on the roll to be controlled throughout the winding phase. The movement connecting-rods also allow a reduced cycle time to be obtained and in particular a cycle time of less than 30 seconds.

[0021] Further features of the invention will be made clearer from the following detailed description, referring to a purely exemplary and therefore non-limiting embodiment thereof, illustrated in the accompanying drawings, in which:

Fig. 1 is a side elevational view illustrating schematically the winder according to the invention with a magazine downstream for feeding the cores and unloading the formed rolls;

Fig. 2 is a schematic side elevational view of the winder of Fig. 1, wherein some elements have been omitted for greater clarity;

Fig. 3 is a schematic front view of the winder of Fig. 2;

Figs. 4 - 6 are schematic side elevational views showing the winder of Fig. 2 in various steps of the work cycle;

Fig. 7 is a broken-away schematic side elevational view, showing the winder with the magazine downstream for feeding cores and unloading rolls during unloading of the formed rolls.

[0022] The winder for film of plastic material according to the invention, denoted as a whole by reference numeral 1 is described with the aid of the drawings. Further on, even if some elements are shown and denoted singly, it is understood that they are arranged in pairs, one on each side of the machine.

[0023] Referring in particular to Figs. 1, 2 and 3, the winder 1 comprises a main frame formed by a base in-

tegral with the ground and two sides or shoulders 2. A web or film 3, coming from an extrusion head placed upstream of the winder 1, enters the winder 1 and is driven by a spreading or widening roller 4 arranged transversely in the rear and upper part of the shoulders 2. The spreading roller 4 is capable of producing forces transverse to the film 3 to eliminate any longitudinal creases.

[0024] The film 3 is then fed by motorised drive rollers 5A and 5B and guided by idle rollers 6A and 6B. In contact with the drive rollers 5A, 5B respective pressure rollers 7A, 7B are provided, mounted on oscillating arms to regulate the drawing or pull on the film 3.

[0025] The film 3 leaving the idle roller 6B is wound around cores 10 (Fig. 3) supported by a spindle 8. The spindle 8 is rotatably supported by the frame of the machine in a working or winding position. As shown better in Figs. 2 and 3, the spindle 8 in the working position is supported at its ends by cradles 9 integral with the shoulders or sides 2 of the frame of the machine. Each cradle 9 has a pair of teeth 16 suitable for retaining the spindle 8 in the winding position.

[0026] Returning to Figs. 1 and 2, upstream of the spindle 8, in the working position, a first compactor roller 11 is provided, rotatably mounted on a pair of arms 12 hinged to the shoulders 2 of the machine. The arm 12 is moved by a linear actuator 13 hinged to the frame 2 of the machine. The linear actuator 13 pushes the arm 12 towards the cores 10 supported by the spindle 8 in the working position, so that the first compactor roller 11 exerts a pressure on the web 3 of the roll being formed, avoiding the formation of air in the turns of the roll.

[0027] Again on the arms 12 a pressure roller 14 is mounted which presses on the compactor roller 11 to stretch out the web 3 which passes in the gap between the pressure roller 14 and the first compactor roller 11 before winding in the cores 10 supported by the spindle in the winding zone.

[0028] In the front part of the shoulders 2 of the machine an unloading connecting-rod assembly 20 is mounted. As shown in Fig. 3, the unloading connecting-rod assembly 20 comprises three arms (two lateral arms 21 and a central arm 21') mounted on a shaft 22 arranged transversely on the sides 2 of the frame of the machine and rotatably mounted around its own axis.

[0029] At the free end of each arm 21, 21' of the unloading connecting-rod assembly 20 a cradle 23 is provided, suitable for holding a spindle. On each arm 21, above the cradle 23, a tooth 24 is mounted, suitable for retaining the spindle in the cradle 23.

[0030] The shaft 22 of the unloading connecting-rod assembly is driven by a motor drive so as to rotate around its own axis. In this way the unloading connecting-rod assembly 20 can move from a working position wherein the cradles 23 act as additional support for the spindle 8 in winding position, to an unloading position wherein it unloads the spindle 8, with the relative rolls formed, into a magazine 60 which is to be described in

detail hereinbelow. During the path from the winding position to the unloading position, the spindle 8 is retained by the teeth 24 in the cradles 23 of the unloading connecting-rod assembly 20.

[0031] As shown in Fig. 3, it should be noted that, when the spindle 8 is in the working position, the unloading connecting-rod assembly 20 is also in the working position. In this case the two lateral arms 21 support the end parts of the spindle 8 and the central arm 21' supports the central part of the spindle 8. In this situation the spindle 8 is supported on five support cradles, that is to say the two cradles 9 of the shoulders 2 of the frame of the machine and the three cradles 23 of the unloading connecting-rod assembly 20.

[0032] As a result, the spindle 8 is highly stabilised and therefore its flexural critical speed at which vibrations are triggered is raised. Consequently, the spindle 8, with a minimal working length of 2 metres, can work at high rotation speeds with the possibility of achieving winding of the web 3 at a rate of approximately 800 m per minute.

[0033] As shown in Fig. 1, the unloading connecting-rod assembly 20 also has a second compactor roller 25. The second compactor roller 25 is rotatably mounted on a slide 26. The slide 26 is slidingly mounted on longitudinal guides 27 provided on the arms 21 of the unloading connecting-rod assembly. In this way the second compactor roller 25 can be moved into position by translation of the slide 26, to adapt to the growth in diameter of the roll 80 being formed and to control the pressure on the roll 80 throughout the changeover and unloading steps.

[0034] The second compactor roller 25 has a brake 28 to stop its rotation and therefore rotation of the roll 80 when winding has been completed.

[0035] Again as shown in Fig. 1, under the winding cradles 9 of the shoulders 2, between the arm 12 of the first compactor roller 11 and the unloading connecting-rod assembly 20, a cutting assembly 50 is provided, slidingly mounted on the shoulders 2 of the frame of the machine. In this way the cutting assembly 50 can move from a lowered rest position to a raised cutting position wherein it performs transverse cutting of the web 3.

[0036] For this purpose, the cutting assembly 50 has a cutting blade 51 for performing transverse cutting of the film 3, once a roll 80 has been completed. The cutting assembly 50 also comprises an electrostatic bar 52 suitable for generating an electrical field for causing adhesion of the cut film on the new cores for winding. In this way the edge of the cut film adheres to the new cores whereon it has to be wound without the need to use glue or the like.

[0037] Again in the front part of the machine, a feed connecting-rod assembly 30 is provided. As shown in Fig. 3, the feed connecting-rod assembly 30 comprises two arms 31 mounted at the ends of a shaft 32 arranged coaxially inside the shaft 22 of the unloading connecting-rod assembly 20. The shaft 32 of the feed connecting-rod assembly is supported transversely on the sides

2 of the frame of the machine and is rotatably mounted around its own axis. The arms 31 of the feed connecting-rod assembly are longer than the arms 21 of the unloading connecting-rod assembly.

[0038] At the free end of each arm 31 of the feed connecting-rod assembly 30 a cradle 33 is provided, suitable for holding a spindle. On each arm 31, above the cradle 33, a tooth 34 is mounted, suitable for retaining the spindle in the cradle 33.

[0039] The shaft 32 of the feed connecting-rod assembly is driven by a motor drive so as to be able to rotate around its own axis. In this way the feed connecting-rod assembly 30 can move from a feed position wherein it takes a spindle, with the relative empty cores, from the magazine 60 to a loading position wherein it loads the spindle with the relative empty cores in the winder 1, in a loading position, wherein a loading connecting-rod assembly 40 is provided.

[0040] The motors which drive the shafts 22 and 32 respectively of the unloading connecting-rod assembly 20 and of the feed connecting-rod assembly 30 are brushless motors placed firmly on one of the shoulders 2 of the machine and driven by respective drives.

[0041] The loading connecting-rod assembly 40 is positioned above winding cradles 9 formed in the shoulders 2 of the frame of the machine. As shown in Fig. 3, the loading connecting-rod assembly 40 comprises three arms (two lateral arms 41 and a central arm 41') mounted on a shaft 42 arranged transversely on the sides 2 of the frame of the machine and rotatably mounted around its own axis. The arms 41, 41' of the loading connecting-rod assembly are shorter than the arms 21 of the unloading connecting-rod assembly.

[0042] At the free end of each lateral arm 41, and also at the end of the central arm 41' of the loading connecting-rod assembly 40, respective cradles 43 are provided, suitable for holding a spindle 8'. On each lateral arm 41 above the cradle 43 a tooth 44 is mounted, suitable for retaining the spindle in the cradle 43. On the central arm 41' two teeth are instead provided.

[0043] The shaft 42 of the loading connecting-rod assembly is driven by a motor drive or by an actuator so as to rotate around its own axis. In this way, the loading connecting-rod assembly 40 can move from a raised loading position wherein the cradles 23 hold a spindle, with preloaded cores, coming from the feed connecting-rod assembly 30 to a lowered working position wherein they deposit the spindle in the cradles 9 of the shoulders 2, that is to say in the winding position.

[0044] It should be noted that, during winding, the loading connecting-rod assembly 40 may be in a working position. In this case the spindle 8 will be supported by eight cradles, that is to say the two cradles 9 of the shoulders 2 of the machine, the three cradles 23 of the unloading connecting-rod assembly 20 and the three cradles 43 of the loading connecting-rod assembly 40. As a result, the spindle 8, having eight points of restraint, is further stabilised and can rotate at high speeds with-

out achieving the critical speed at which oscillation is triggered.

[0045] As shown in Fig. 1, in the loading connecting-rod assembly 40 a launch motor 45 is provided, suitable for causing rotation of the spindle 8, when it is in the cradles 43 of the arms 41, 41' of the loading connecting-rod assembly 40.

[0046] As shown in Fig. 1, downstream of the winder 1 a magazine 60 is provided for feeding the empty cores 10 and for unloading the formed rolls 80. The magazine 60 has a support frame 61. On the frame 61 a surface 62 for feeding cores is hinged, acting as a magazine of the cores, wherein the cores intended for winding for the formation of rolls are fed. The surface 62 has at one end a cradle 63 suitable for supporting a plurality of cores arranged coaxially.

[0047] The surface 62 is moved by a linear actuator 64 mounted on the frame 61. In this way the surface 62 can be moved from a horizontal core feeding position to an oblique spindle insertion position wherein the spindle is introduced in the cores supported in the cradle 63 and the spindle with the empty cores is taken by the feed connecting-rods 30.

[0048] On the frame 61, under the core feeding surface 62, a horizontal support 65 is provided whereon horizontal cradles 66, suitable for supporting a spindle 8, are mounted slidingly. The horizontal cradles 66 are moved by a linear actuator 67 fixed to the support 61. In this way the horizontal cradles 66 can be moved from an advanced position towards the winder 1 wherein they hold the spindle 8 with the formed roll coming from the unloading connecting-rods 20 to a position withdrawn from the winder 1, wherein they take the spindle 8 with the formed roll above a motorised platform 68.

[0049] The motorised platform 68 can move vertically from a raised position, wherein it supports the rolls, to a lowered position wherein it tips the rolls 80 onto a chute 69 to unload the formed rolls towards storage. For this purpose a linear actuator 70 is provided which allows tipping of the platform 68, when it is in the lowered position of unloading of the roll 80.

[0050] When the rolls 80 are supported by the platform 68 in a raised position, a spindle extraction/insertion device (not shown) intervenes and extracts the spindle 8 from the formed rolls 80 and inserts it in the cores 10 which are supported in the cradle 63 of the surface 62 for loading cores.

[0051] It should be noted that expansion spindles 8 are used which, when pressurised, increase in diameter to grip the cores and, when depressurised, decrease in diameter to allow their extraction from the cores. For this purpose the spindle extraction/insertion device must have, in addition to means of holding the spindle, also means of expelling/feeding air so as to expel the air from the spindle in order to make it decrease in diameter during its extraction from the cores of the formed rolls and so as to feed air into the spindle in order to make it increase in diameter after having inserted it in the new

cores to guarantee good grip with the cores.

[0052] Hereinbelow, in particular with the aid of Figs. 4 - 9, the operation of the winder 1 according to the invention is described.

[0053] As shown in Fig. 4, initially the spindle 8 with the preloaded cores 10 is in the loading position, denoted by A, supported by the loading connecting-rod assembly 40. The loading connecting-rods 20 (not shown in the figure) are spaced from the compactor roller 11 to an adequate extent to allow the rotatory movement of the loading connecting-rods 40 and the movement of the cutting blade 51 coming from below.

[0054] The launch motor 45 of the loading connecting-rod assembly 40 starts to rotate the spindle 8. The loading connecting-rod assembly 40 rotates around fulcrum point F1 and the spindle 8 performs the arc of circumference C1, moving from the loading position A to the winding position, denoted by B, wherein it is supported by the cradles 9 of the shoulders 2.

[0055] When the spindle is in the winding position it comes into contact with the first compactor roller 11. Consequently the edge of the web 3 is cut by the cutting blade 51 and brought to adhere with the cores 10 by the electrical field generated by the electrostatic bar 52.

[0056] A spindle 8, already ready with new cores 10, is positioned on the loading connecting-rods 40. The presser roll 11 is at rest. The cutting blade 51 and the electrostatic bar 52 are at rest.

[0057] Hereinbelow, with reference to Fig. 5, the final phase of winding and start of the changeover cycle is described.

[0058] The roll 80 has reached the diameter of the start of the changeover cycle. The new spindle 8' in the loading connecting-rods 40 is launched at the line speed by the spindle launch motor 45. The pressure roller 14 on the unloading connecting-rods 20 is launched at the line speed by the appropriate motor and brought into contact with the roll 80.

[0059] Hereinbelow, with reference to Fig. 6, the step of reel change is described.

[0060] The unloading connecting-rods 20, by rotating around their fulcrum 22, start the unloading rotatory movement. The compactor roller 25 and the pressure roller 11 maintain contact with the roll 80 until maximum range of the stroke of the pressure roller 11 is achieved.

[0061] The electrostatic bar 52 is activated. The unloading connecting-rods 20 continue their rotatory movement until achieving a sufficient gap for introduction of the new spindle 8' driven from above by the loading connecting-rods 40 and the cutting blade 51 from below.

[0062] The new spindle 8' starts the descent stroke towards the working position. Having achieved contact of the core 10' of the new spindle 8' with the pressure roller 11, the upward stroke of the cutting device 50 starts and the film 3 is cut by the cutting blade 51. Subsequently the cutting device 50 descends again into the rest position and the electrostatic bar 52 is deactivated.

[0063] The compactor roller 25 on the unloading connecting-rods 20 is braked, causing stopping of the rotation of the formed roll 80.

[0064] Hereinbelow, with reference to Fig. 7, the reel unloading step is described.

[0065] The unloading connecting-rods 20 restart their unloading rotatory movement, depositing the formed roll 80 on the horizontal unloading cradles 66 of the magazine 6. The linear actuators 67 drive translation of the horizontal cradles 66 into the unloading position, denoted by C, allowing return of the unloading connecting-rods 20 towards the working position B.

[0066] Once the unloading connecting-rods 20 have returned into the working position B, the loading connecting-rods 40 rise again into the waiting position A and receive a third spindle 8" ready with new cores 10" carried by the feed connecting-rods 30 which perform a rotatory movement around the fulcrum 22.

[0067] The platform 68 rises so as to support the formed rolls 80 which are in the unloading position C, then the spindle 8 is deflated and extracted from the rolls 80 supported by the respective cores 10. At this point the platform 68 descends to the height of the unloading chute 69 and, tilting, expels the formed rolls 80 onto the chute of the unloading magazine.

[0068] Subsequently the core feeding surface 62 is made to tilt by means of the actuator 64, so that the spindle 8 removed from the formed rolls 80 is inserted in the cores 10 arranged in the cradle 63 of the core feeding surface and is inflated inside them. Then the feed connecting-rods 30 take the spindle 8 with the new cores 10 and return it into a waiting position. Finally the core feeding surface 62 returns into a high position.

[0069] Numerous modifications of detail and variations within the reach of a person skilled in the art may be made to the present embodiment of the invention, without thereby departing from the scope of the invention as set forth in the appended claims.

Claims

1. A winder (1) for film of plastic material comprising:

- drawing or pulling assemblies for feeding the film (3) towards a winding zone wherein the film is wound on at least two cores (10) supported by a spindle (8) rotatable around its own axis, for formation of rolls (80),
- spindle support means for supporting the spindle (8) in said winding zone,
- pressure control means (11, 25) for controlling the pressure of the film (3) on the roll (80) being formed during winding,
- spindle loading means (30, 40) suitable for loading a spindle with empty cores (10) from a magazine (60) to the winder,
- spindle unloading means (20) suitable for un-

loading the spindle with the rolls formed from the winder (1) towards the magazine (60) and cutting means (50) suitable for cutting the film (3) transversely once at least one pair of rolls (80) has been completed on the spindle (8) which has to be unloaded towards the magazine (60),

characterised in that

- said spindle support means comprise at least two cradles (9) mounted fixed in the shoulders (2) of the frame of the machine, so that the roll (80) remains in the same position from the start to the end of its formation and the spindle (8) is supported by at least five cradles (9, 23) in order to achieve good rigidity of the system so as to achieve high speeds of rotation of the spindle and
- said pressure control means comprise at least a first roller (14) movably mounted to adapt to the increase in diameter of the roll (80) being formed in the winding zone and a second roller (25) mounted on connecting-rods and movable so as to adapt to the increase in diameter of the roll (80) being formed, used in the changeover step.

2. A winder according to claim 1, **characterised in that** said spindle unloading means (20) comprise an unloading connecting-rod assembly (20) hinged to the shoulders (2) of the frame of the machine and provided with cradles (23) with retaining teeth (24) for taking said spindle (8) from the winding zone and taking it into the zone of unloading into the magazine (60), said cradles (23) of the unloading connecting-rod assembly supporting the spindle (8) in the winding zone so as to improve its stabilisation during winding.

3. A winder according to claim 2, **characterised in that** said unloading connecting-rod assembly (20) comprises three arms (21, 21') with respective cradles (23) engaging in the two lateral portions and in the central portion of the spindle (8), said arms (21, 21') being integral with a shaft (22) rotatably supported at its ends by means of the shoulders (2) of the frame of the machine and moved to rotate around its own axis by means of a motor drive.

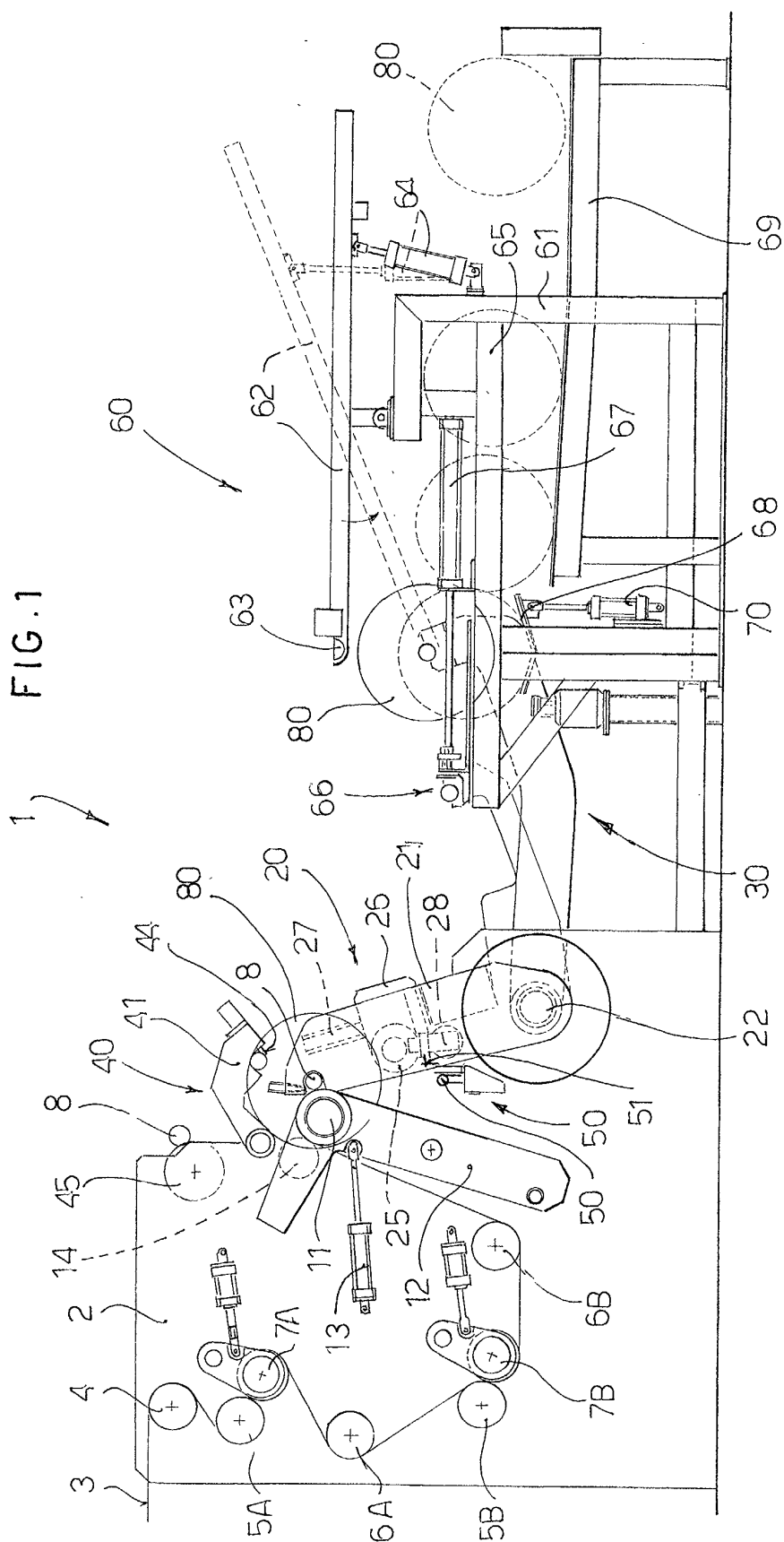
4. A winder according to claim 2 or 3, **characterised in that** said pressure control means (11, 25) comprise a first compactor roller (11) rotatably mounted on arms (12) hinged to the shoulders (2) of the frame of the machine and a second compactor roller (25) rotatably mounted on a slide (26) translating on said unloading connecting-rod assembly (20).

5. A winder according to claim 4, **characterised in that** said arms (12) of the first compactor roller (11) are moved by means of linear actuators (13) to adjust to the increase in diameter of the roll (80) being formed and on said arms (11) a pressure roller (14) is rotatably mounted which presses against the first compactor roller (11) to spread out or stretch out the film (3) which passes in the gap between said two rollers (11, 14).
6. A winder according to any one of the previous claims, **characterised in that** said spindle loading means (30, 40) comprise:
- a feed connecting-rod assembly (30) hinged to the shoulders (2) of the frame of the machine and provided with cradles (33) with retaining teeth (34) so as to take a spindle (8) with empty cores (10) from said magazine and take it into a zone of the winder (1) for spindle loading, and
 - a loading connecting-rod assembly (40) hinged to the shoulders (2) of the frame of the machine and provided with cradles (43) with retaining teeth (44) for taking the spindle (8) with empty cores (10) from said feed connecting-rod assembly (20) in said spindle loading zone of the winder and taking it into the winding zone in the cradles (9) integral with the shoulders of the machine, said cradles (43) of the loading connecting-rod assembly supporting the spindle (8) in the winding zone so as to improve its stabilisation during winding.
7. A winder according to claim 6, **characterised in that** said feed connecting-rod assembly (30) comprises two arms (31) with respective cradles (33) engaging in the two lateral portions of the spindle (8), said arms (31) being integral with a shaft (32) rotatably supported at its ends by means of the shoulders (2) of the frame of the machine and moved to rotate around its own axis by means of a motor drive, said shaft (32) of the feed connecting-rod assembly being coaxial to the shaft (22) of the unloading connecting-rod assembly and said arms (31) of the feed connecting-rod assembly being longer than the arms (21) of the unloading connecting-rod assembly.
8. A winder according to claim 7, **characterised in that** said shaft (22) of the unloading connecting-rod assembly and said shaft (32) of the feed connecting-rod assembly are moved to rotate by means of respective brushless motors mounted on one of the shoulders (2) of the machine and driven by respective drives.
9. A winder according to any one of claims 6 to 8, **characterised in that** said loading connecting-rod as-

sembly (40) comprises three arms (41, 41') with respective cradles (43) engaging in the two lateral portions and in the central portion of the spindle (8), said arms (41, 41') being integral with a shaft (42) rotatably supported at its ends by means of the shoulders (2) of the frame of the machine and moved to rotate around its own axis by means of a motor drive or actuator means.

10. A winder according to any one of the previous claims, **characterised in that** said magazine (60) comprises a support frame (61) whereon a surface (62) is hinged whereon the empty cores (10) are fed, a horizontal support (65) being provided under said surface (61) whereon horizontal cradles (66) are mounted slidingly to take the spindle (8) with the formed rolls (80) from the unloading position towards a driven platform (68) which can translate vertically to tip the formed rolls (80) towards a chute (69) for unloading of the rolls.
11. A winder according to any one of the previous claims, **characterised in that** said cutting means (50) comprise a cutting blade (51) for transverse cutting of the film (3) and an electrostatic bar (52) for creating adhesion of the cut edge of the film so as to cause its adhesion to the empty core (10) without the use of glue, said cutting means being mounted movably on the shoulders of the machine so as to change from a lowered rest position to a raised cutting position.

FIG. 1



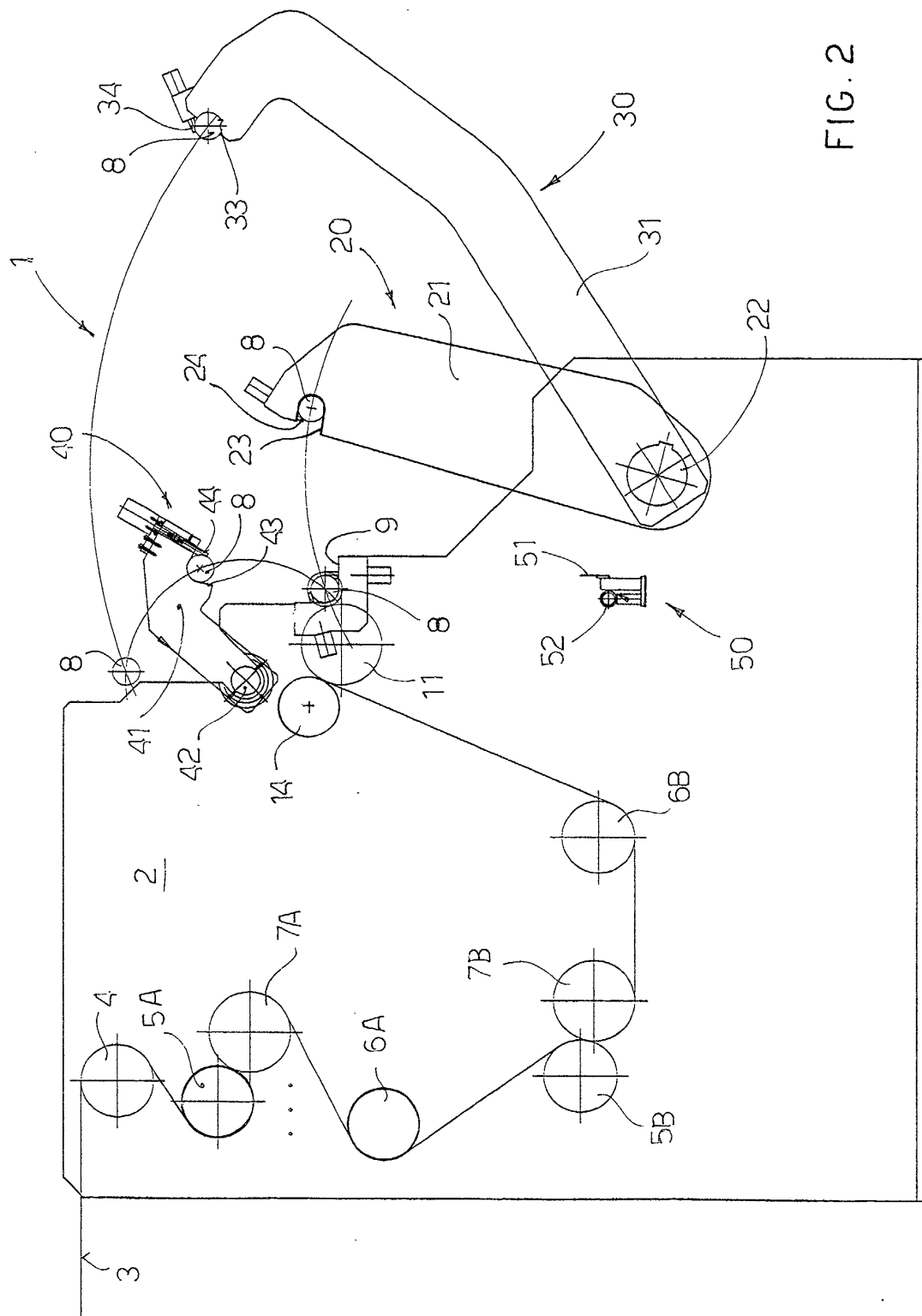
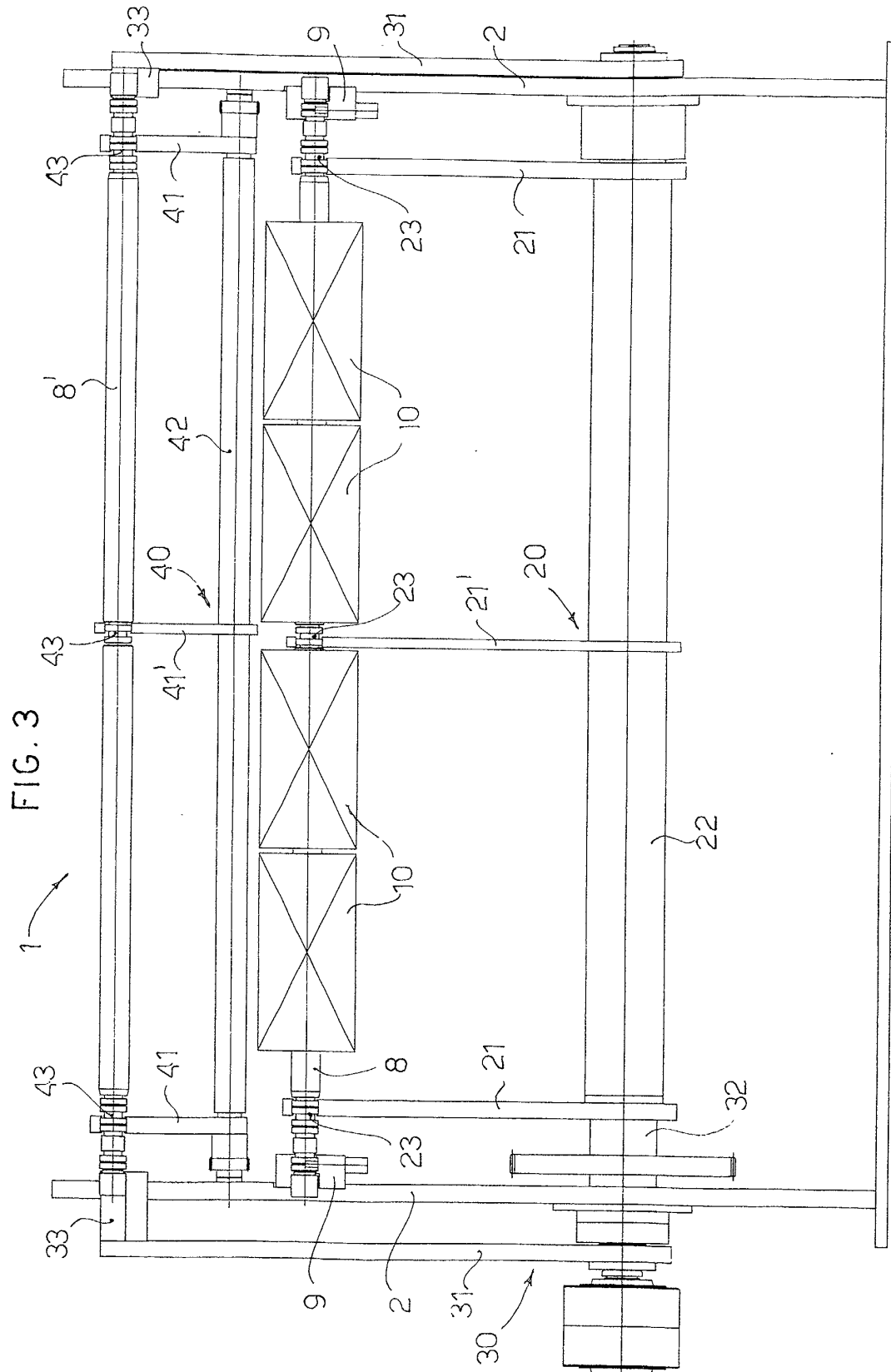


FIG. 2



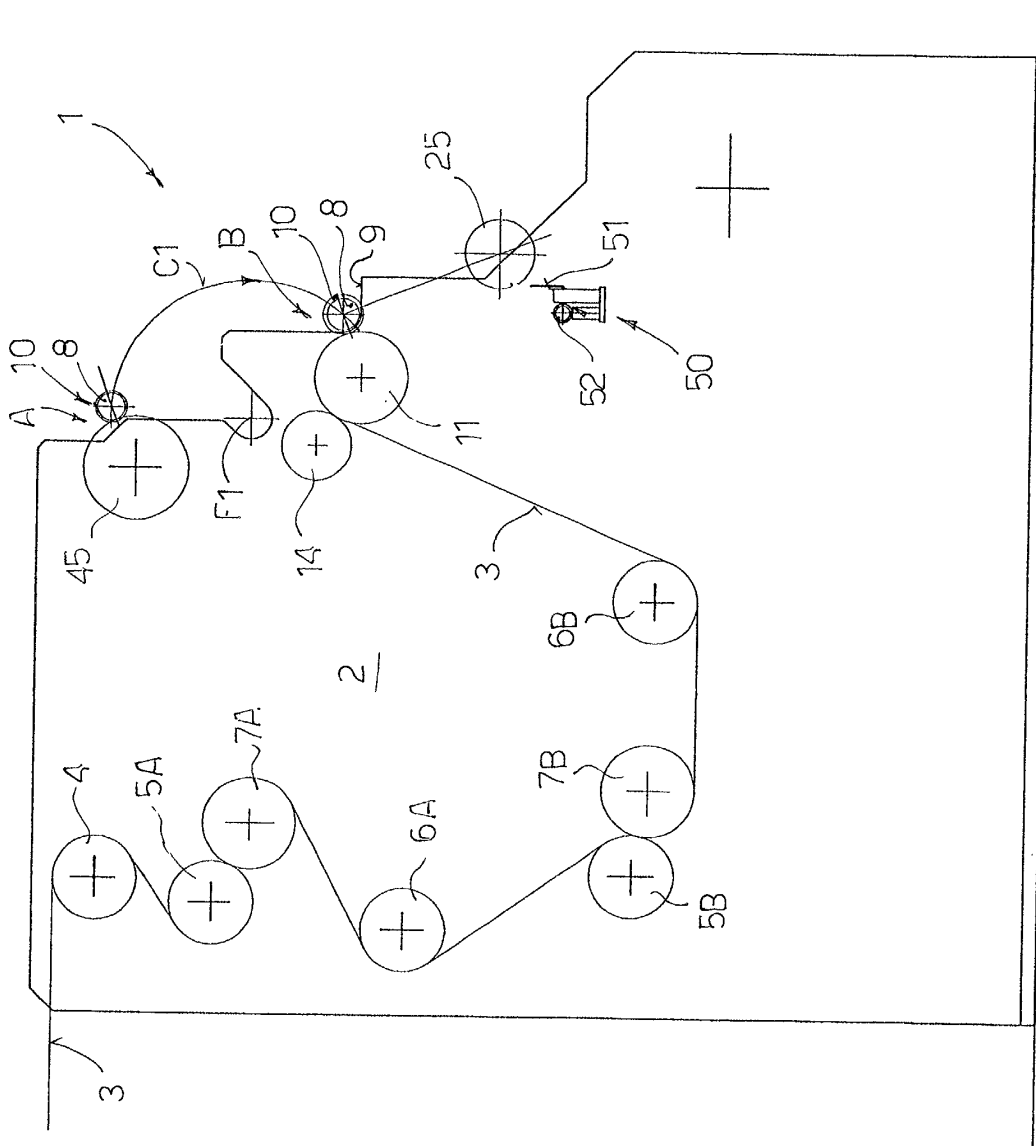
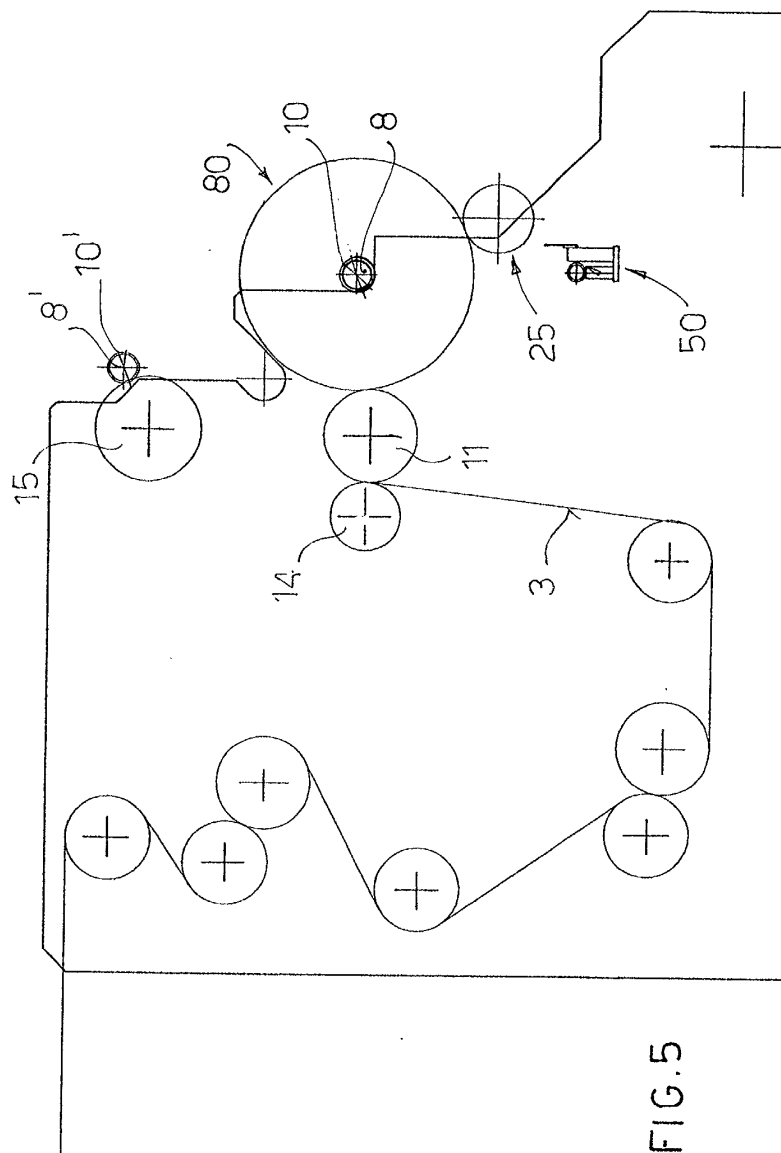
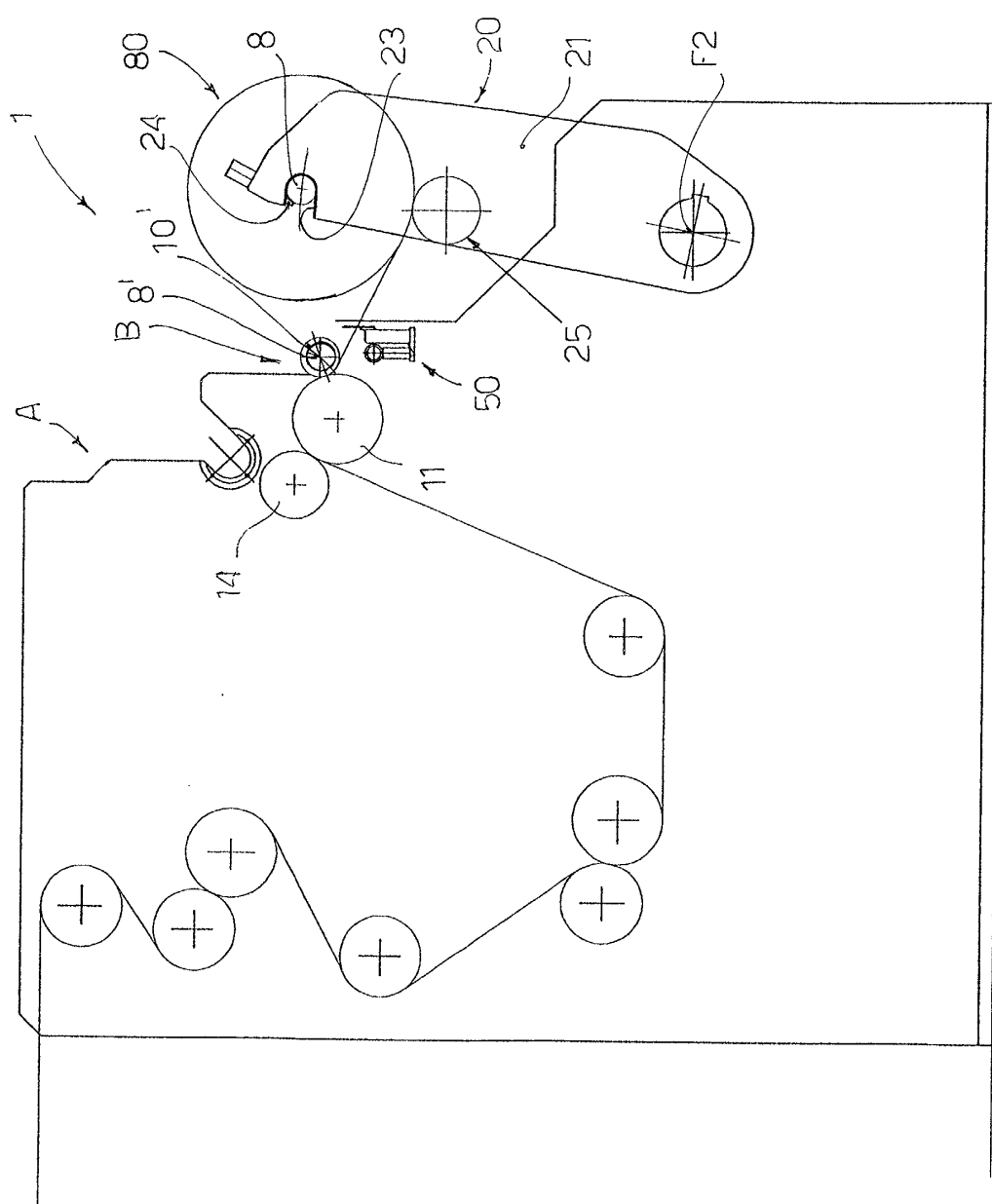


FIG. 4





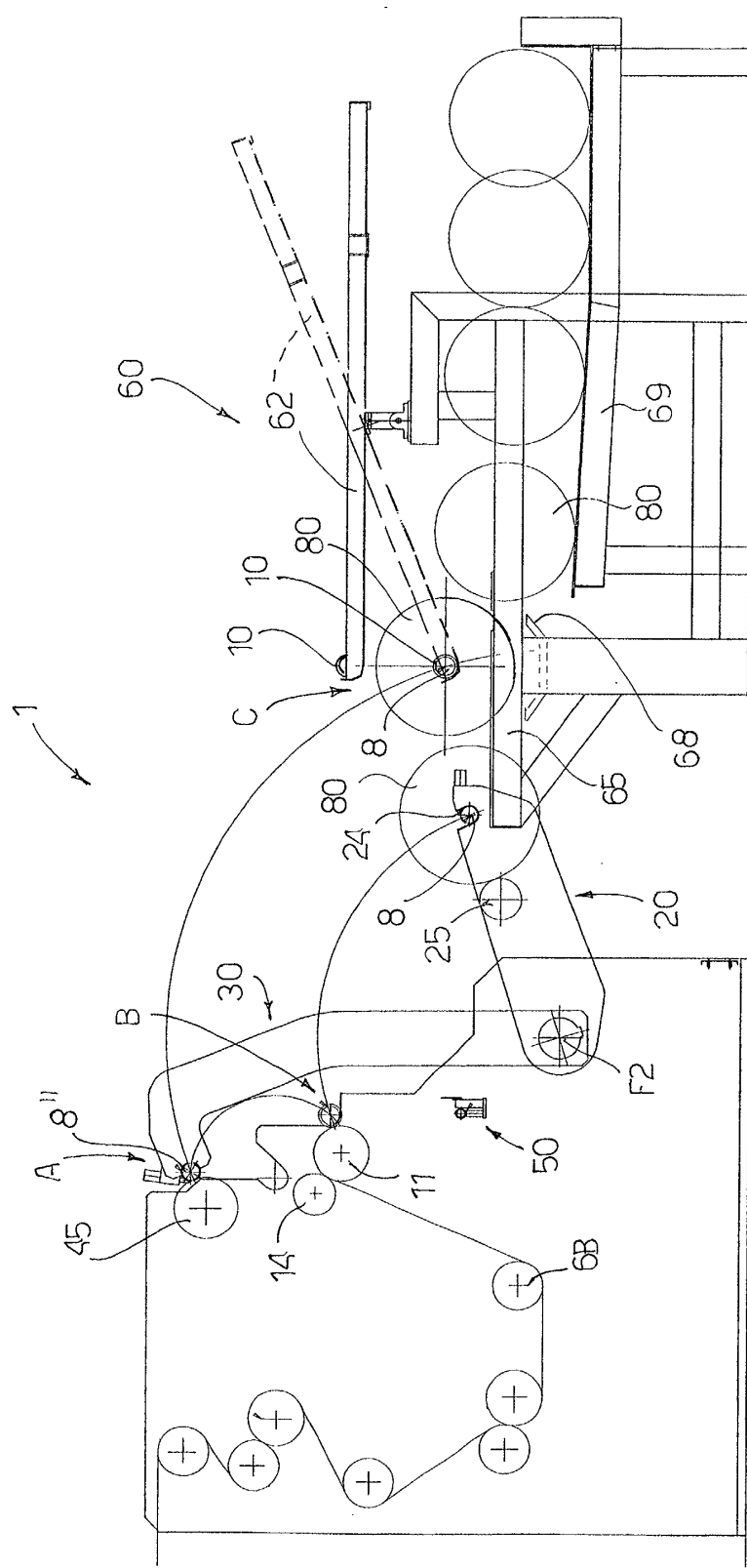


FIG. 7



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 02 42 5144

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	EP 0 994 820 A (PERINI FABIO SPA) 26 April 2000 (2000-04-26) * column 3, line 50 - column 7, line 50; figures *	1	B65H19/22 B65H18/10
A	EP 0 943 569 A (VALMET KARLSTAD AB) 22 September 1999 (1999-09-22) * column 3, line 26 - column 6, line 34; figures *	1	
A	EP 0 767 123 A (FUJI PHOTO FILM CO LTD) 9 April 1997 (1997-04-09) * the whole document *	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			B65H
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 13 August 2002	Examiner Haaken, W
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 02 42 5144

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

13-08-2002

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
EP 0994820	A	26-04-2000	IT	FI970166 A1	11-01-1999
			AT	214031 T	15-03-2002
			AU	8240298 A	08-02-1999
			BR	9810692 A	05-09-2000
			DE	69804103 D1	11-04-2002
			EP	0994820 A1	26-04-2000
			JP	2001509466 T	24-07-2001
			PL	337898 A1	11-09-2000
			US	6129304 A	10-10-2000
			CN	1259920 T	12-07-2000
			WO	9902439 A1	21-01-1999
			ZA	9805860 A	05-10-1998
EP 0943569	A	22-09-1999	SE	511670 C2	08-11-1999
			BR	9908860 A	31-10-2000
			CA	2322021 A1	23-09-1999
			EP	0943569 A2	22-09-1999
			EP	1071627 A1	31-01-2001
			JP	2002506784 T	05-03-2002
			SE	9800838 A	17-09-1999
			WO	9947442 A1	23-09-1999
			SE	511829 C2	06-12-1999
			SE	9900460 A	17-09-1999
			US	6047916 A	11-04-2000
			US	6145778 A	14-11-2000
EP 0767123	A	09-04-1997	JP	9100050 A	15-04-1997
			DE	69618410 D1	14-02-2002
			DE	69618410 T2	06-06-2002
			EP	0767123 A2	09-04-1997
			US	5799898 A	01-09-1998