(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 234 789 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
28.08.2002 Bulletin 2002/35

(51) Int Cl.[7]: **B65H 19/30**

(21) Application number: **02003229.8**

(22) Date of filing: **20.02.2002**

(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

(30) Priority: **27.02.2001 IT MI010389**

(71) Applicant: **MANULI STRETCH S.p.A.**
04011 Aprilia (Latina) (IT)

(72) Inventors:
- **Brambilla, Guiseppe Dario**
  20123 Milano (IT)
- **Bombonato, Marco Maria**
  86077 Pozzilli (Prov. of Isernia) (IT)

(74) Representative: **Modiano, Guido, Dr.-Ing. et al**
Modiano & Associati SpA
Via Meravigli, 16
20123 Milano (IT)

(54) Process and machine for winding thermoplastic film in bobbins of chosen size

(57) A process for the continuous winding, with an automatic cycle, of thermoplastic film in bobbins of a chosen size directly from the film production apparatus or from large bobbins, wherein the wound bobbin (3), by means of automatic operations, is unloaded from the working seat (after cutting the film being wound), the spindle (2) of the cardboard core-spindle assembly is deflated of air, the bobbin (3) is removed from the spindle (2) and the spindle (2) is inserted in a new cardboard core and then inflated with air in order to rigidly couple the cardboard core with the spindle (2), and finally the new cardboard core-spindle assembly, after spraying onto the cardboard core a film of glue for the adhesion of the film, is placed in standby, waiting to be inserted in the working seat in order to begin the winding of a new bobbin .

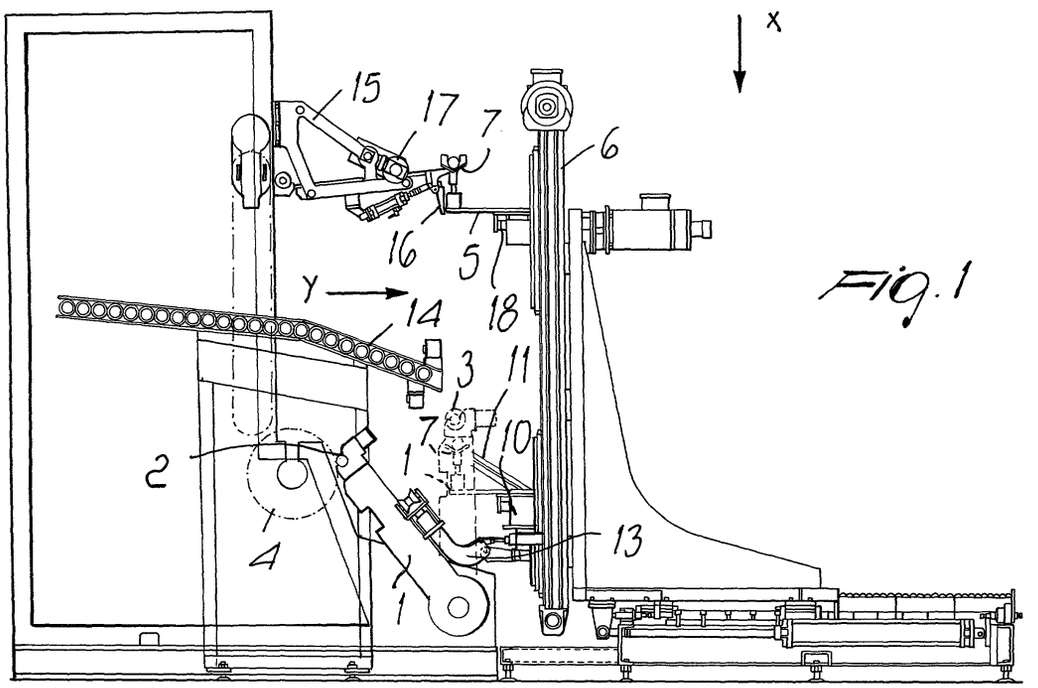

Fig. 1

EP 1 234 789 A2

Description

[0001] The present invention relates to a process and a machine for continuously winding, with an automatic cycle, thermoplastic film so as to obtain bobbins of a chosen size and length directly in line with the film production apparatus or starting from large bobbins.

[0002] Previously, thermoplastic films obtained by cast-extrusion were collected on winding rollers so as to obtain large bobbins from which bobbins of the chosen size were prepared by rewinding.

[0003] The rewinding step was performed discontinuously, since the unloading of the already-wound bobbin and the subsequent loading of a new tubular core (cardboard element) for winding required interrupting the operation.

[0004] Due to the large dimensions of the master bobbin during unwinding, the steps for stopping and subsequently restarting the bobbin required rather long times compared to those actually required to wind the film.

[0005] In order to obviate this drawback, it has been proposed to rewind the film that arrives from the master bobbin by using a machine capable of performing the winding sequentially and in which the acceleration and stopping of the master bobbin occur only at the beginning and at the end of the rewinding operation. A rewinding machine of this type is disclosed in Italian Patent Application No. MI98A000375 filed on May 26, 1998.

[0006] Rewinding machines of the above mentioned type can be used so as to work directly in line with the apparatus for producing the film, which is conveniently cut into bands of the chosen width, using a rewinding machine for each band.

[0007] However, by proceeding as described above the rewinding operation becomes expensive, due both to the size of the investments required and to the operating costs.

[0008] Accordingly, the need is felt in the field to have a process and a machine capable of performing continuously and with an automatic cycle the winding of a thermoplastic film directly in line with the production of the film or starting from large bobbins so as to obtain smaller bobbins.

[0009] By working according to the above described process directly in line with the film production apparatus, the rewinding step would become unnecessary.

[0010] It has now been found unexpectedly that it is possible to produce continuously and with an automatic cycle bobbins of chosen dimensions and length, working directly in line with the film production apparatus or starting from any other winding machine.

[0011] The process according to the invention comprises the following steps starting from the already-wound bobbin :

-- disengaging the cardboard core-spindle assembly from the working seat;
-- deflating the air from the spindle of the cardboard core-spindle assembly (the spindle is inflated with air in order to couple it to the cardboard core and thus prevents its separate rotation; the spindle is provided with an air-filled chamber which, by inflating, causes the protrusion of strips of metal or plastic which, by expanding, lock the cardboard core on the spindle);
-- removing the bobbin from the spindle;
-- fitting a new cardboard core on the spindle;
-- positioning the new cardboard core-spindle assembly in a standby seat before the winding step begins.

[0012] The manner of performing the various steps is described in the claims.

[0013] The cycle can be applied to the simultaneous winding of a series of bobbins (generally three) directly in line with the production apparatus; in this case, the steps for winding the various bobbins are staggered, so as to allow the completion of the cycle for each bobbin before a new one begins.

[0014] The cardboard cores that can be used generally have a diameter of 38, 50 and 76 mm; their width is generally between 400 and 530 mm.

[0015] The process according to the invention, in addition to allowing the production of small-size bobbins manufactured continuously and with an automatic cycle, allows to exclude any contact of operators with the winding roller and the bobbins during winding, thus reducing the risk of accidents.

[0016] Any kind of thermoplastic film can be used; in particular, the polyethylene multilayer stretch film used for the packaging of palletized units is wound.

[0017] An exemplifying but non-limitative description of the process and of the machine used to perform the process is given hereafter with the aid of Figures 1 to 3, which are respectively a lateral elevation view of the machine (Figure 1), a plan view (Figure 2), and a side view taken along Y (Figure 3).

[0018] In Figure 1, the connecting rod 1 supports the spindle 2 on which the bobbin 3 being wound in contact with the roller 4 is fitted.

[0019] Once the bobbin 3 has reached its intended size (which corresponds to the required length), the connecting rod 1, after cutting the film, reaches a vertical position. The spindle 2 is braked and locked in its rotary motion by actuating two pneumatic pistons and is disengaged from the connecting rod 1 by opening two other pairs of pneumatic pistons (not shown in the figure).

[0020] The carriage 5 (moved by motors as shown in the figure and provided with a horizontal translational motion by sliding on the guide 10 and a vertical motion on the guide 6) is in the standby position below the bobbin 3 when the connecting rod 1 reaches the vertical position and rises, sliding on the guide 6 until the bobbin 3 is placed on the cradle 7 rigidly coupled to the carriage 5.

[0021] A series of optical sensors (not shown in the figure), arranged below the cradle 7, indicate the pres-

ence of the bobbin 3 in the cradle, thus providing the confirmation for moving on to the next step (the reference positions for the movements along the vertical guide 6 are confirmed by the presence of microswitches 8, shown in Figure 3).

[0022] The carriage 5 performs a further upward translational motion, lifting the spindle-bobbin assembly 2-3, releasing it from the linkage 1, which can thus return to the working position and receive a new cardboard core-spindle assembly so as to start a new winding step.

[0023] The deflation unit 9 (Figure 3), arranged on the horizontal guide 10 in axial alignment with the spindle 2, is activated and discharges air from the spindle 2 by acting on the deflation valve.

[0024] Once the deflation unit 9 has returned to its position, the carriage 5 performs an outward translational motion on the horizontal guide 10, while the spindle 2 remains locked by the support 11 (Figure 3), thus causing the extraction of the bobbin 3, drawn by the cradle 7.

[0025] The reference positions for the movements along the horizontal guide 10 are determined by microswitches 12, shown in Figure 2.

[0026] As it continues in its horizontal translational motion, the carriage 5 engages the microswitch, which provides the clearance signal for the actuation of the connecting rod assembly 13 for supporting the spindle 2.

[0027] The connecting rod assembly 13 is meant to support the spindle 2 when the bobbin 3, drawn by the cradle 7, is extracted fully from said spindle, which would otherwise be supported only by the support 11.

[0028] The stroke of the carriage 5 along the horizontal guide 10 continues until it arrives below the cardboard core loading assembly 14.

[0029] The bobbin 3 is unloaded from the cradle 7; the optical sensors connected to the cradle, once illuminated, provide the clearance signal for the fall of the cardboard cores onto said cradle. The fall of the cardboard cores and the supply of new cardboard cores on the loading assembly 14 are performed by means of pneumatic pistons (not shown).

[0030] The cradle 7, with the new cardboard cores, moves upward with the carriage 5 so as to align the axis of the cardboard cores with the axis of the spindle 2.

[0031] During the step for the translational motion of the cradle 7 in order to fit the cardboard cores on the spindle 2, said cardboard cores are sprayed with a film of adhesive by a gun that is provided and positioned appropriately for this purpose (the film of glue is meant to make the film adhere to the cardboard core for the winding step).

[0032] During the step for fitting the cardboard cores on the spindle 2, the linkage assembly 13 returns to the position that preceded its opening in order to support the spindle 2 in the step for extracting the bobbin 3, thus allowing the regular passage of the carriage 5.

[0033] After completing the step for fitting the cardboard cores on the spindle 2, the carriage 5 is actuated upward until it moves beyond the spindle loading assembly 15 and its position is reported by a microswitch.

[0034] Once the carriage 5 has stopped, the arm 16 provided on the loading assembly 15 with the function of supporting the spindle 2 opens; the subsequent descent of the carriage 5 until it returns to the position it had at the beginning of the cycle allows the spindle 2 to be deposited onto the supporting arm 16.

[0035] Since the spindle loader 15 is slightly inclined with respect to the winding unit, the spindle 2 can slide toward the inflator assembly 17.

[0036] After performing inflation, the spindle 2 continues its descent until it reaches the chain 18.

[0037] When the winding roller 4 requests a new spindle, the chain 18 carries the spindle 2 so that it rests on the winding roller; a new step thus begins.

[0038] The disclosures in Italian Patent Application No. MI2001A000389 from which this application claims priority are incorporated herein by reference.

[0039] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A process for the continuous winding, with an automatic cycle, of thermoplastic film so as to obtain bobbins of chosen diameter and size directly in line with the film production system or starting from large bobbins in order to obtain smaller bobbins, comprising the following steps, performed sequentially starting from a bobbin after completing the winding step:

1) disengagement from the working seat of the cardboard core-spindle assembly on which the bobbin is wound:
2) deflation of the air from the spindle;
3) removal of the bobbin from the spindle;
4) fitting of a new cardboard core on the spindle;
5) inflation of the spindle with air;
6) positioning of the new spindle-cardboard core block in the standby seat before the new winding step, in which:

-- during step 1), the connecting rod (1) that supports the spindle (2) on the cardboard core of which the bobbin (3) is being wound in contact with the roller (4), after completing the winding and after cutting the film, reaches a vertical position, while the carriage (5), which has a horizontal transla-

tional motion along the horizontal guide (10) and a vertical motion along the vertical guide (6), is in a standby position below the bobbin (3) when the connecting rod (1) reaches the vertical position; the carriage then rises, sliding on the guide (6), until the bobbin (3) is positioned on the cradle (7), which is rigidly coupled to the carriage, and performs a further upward translational motion, lifting the spindle-bobbin assembly (2-3), releasing it from the connecting rod (1), which can return to the working position;

-- during step 2), the deflation unit (9) arranged on the horizontal guide (10) in axial alignment with the spindle (2) is actuated so as to discharge the air from the spindle (2);

-- during step 3), the carriage (5), after the deflation assembly has returned to its position, performs an outward translational motion on the horizontal guide (10), while the spindle remains locked by the support (11), causing the extraction of the bobbin (3), which is collected in the cradle (7);

-- during step 4), the carriage (5), as it continues its translational motion along the horizontal guide (10), engages the microswitch (12), which provides the clearance signal for the actuation of the connecting rod assembly (13) so as to support the spindle (2) when the bobbin (3) drawn by the cradle (7) is extracted fully from the spindle; the carriage continues in its translational motion until it lies below the cardboard core loading assembly (14), from which the cardboard cores are arranged by gravity on the cradle (7), previously freed of the bobbin (3); it then moves upward along the guide (6), so as to align the axis of the cardboard cores with the axis of the spindle (2) for the insertion of a cardboard core by virtue of a translational motion of the cradle (7) (during the translational motion of the cradle (7), the cardboard cores are sprayed with a film of glue in order to ensure the adhesion of the film to the cardboard core when the winding step begins);

-- during step 5), the carriage (5) is moved upward until it moves beyond the spindle loading assembly (15), which is provided with the arm (16), which opens so as to support the spindle (2); then the carriage (5) descends so as to return to the cycle start position, thus allowing the spindle (2) to be deposited on the arm (16), from which the spindle then slides toward the inflation assembly (17), since the spindle loader is slightly inclined with respect to the winding unit;

-- during step 6), once inflation has been performed, the spindle (2) continues its descent until it reaches the chain (18), by which the spindle (2) is placed in its working seat in contact with the roller (4) when it requires a new spindle-cardboard core for a new winding step.

2. The process according to claim 1, wherein a series of bobbins is wound in line with the film production system.

3. The process according to claims 1 or 2, wherein the bobbins are wound onto cardboard cores having a diameter of 38, 50 and/or 76 mm and a length between 400 and 530 mm.

4. The process according to each one of claims 1 to 3, wherein the position of the movements of the carriage (5) along the guides (10) and (6) is set by microswitches, while the actuation of the various connecting rods that operate in the process, the fall of the cardboard cores from the cardboard core loading assembly (14), their supply in said assembly, and the step for positioning the spindles on the arm (16) are provided by means of pneumatic pistons.

5. A machine for winding thermoplastic film according to the process of each one of claims 1 to 4, comprising: a connecting rod (1) for positioning a spindle on which the bobbin (3), wound in contact with the roller (4), is fitted; a carriage (5), which has a horizontal translational motion and a vertical translational motion by sliding respectively on the guides (10) and (6) and performs the movements required to provide the various steps of the winding cycle; an assembly for deflating/inflating the air from and in the spindle; an assembly for supporting the spindle during its extraction from the bobbin (3); a cradle for collecting the wound bobbins and then the cardboard cores for their fitting on the spindles; and an assembly for positioning the cardboard core-spindle assemblies while waiting to start a new cycle.

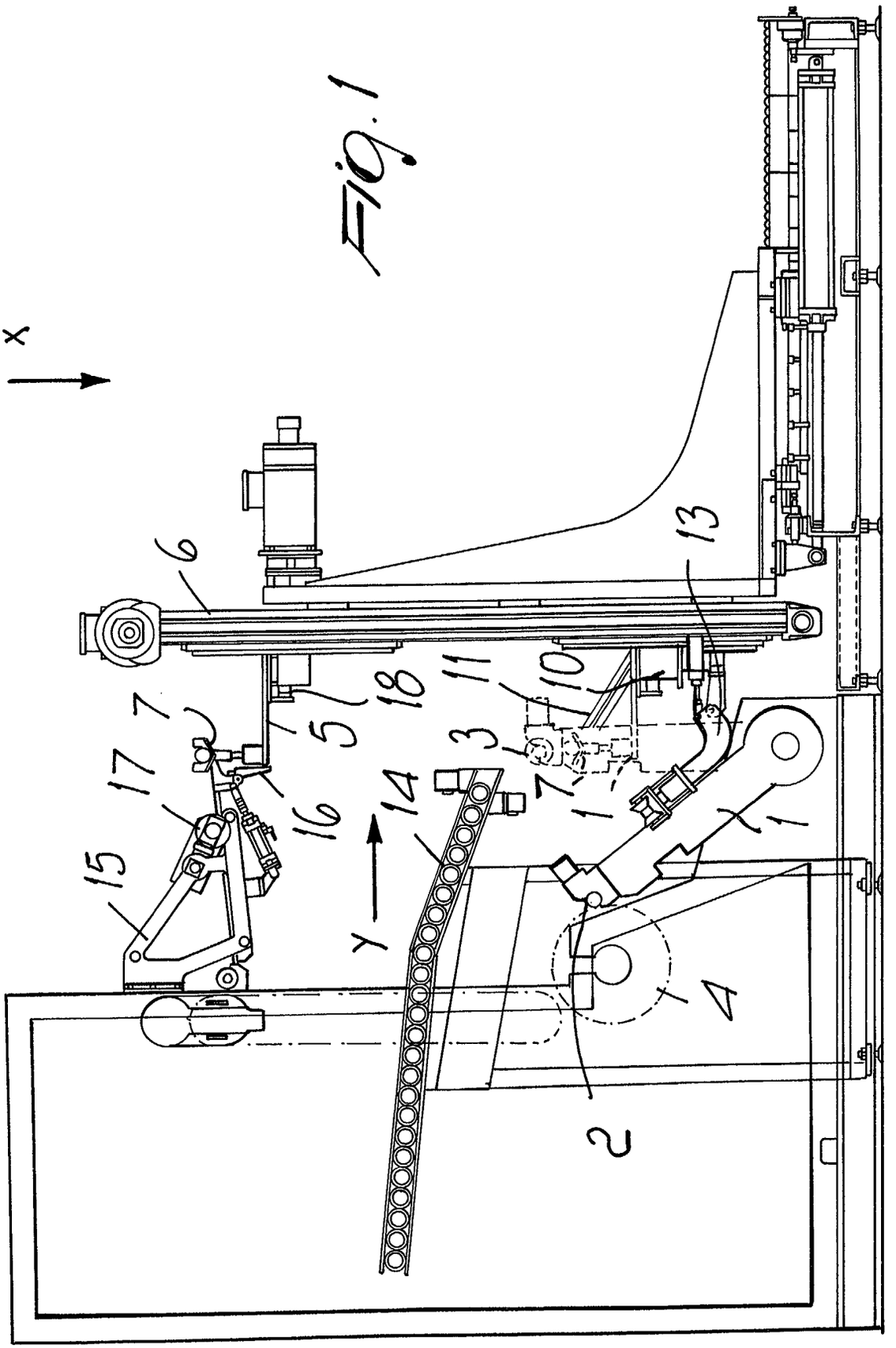

Fig. 1

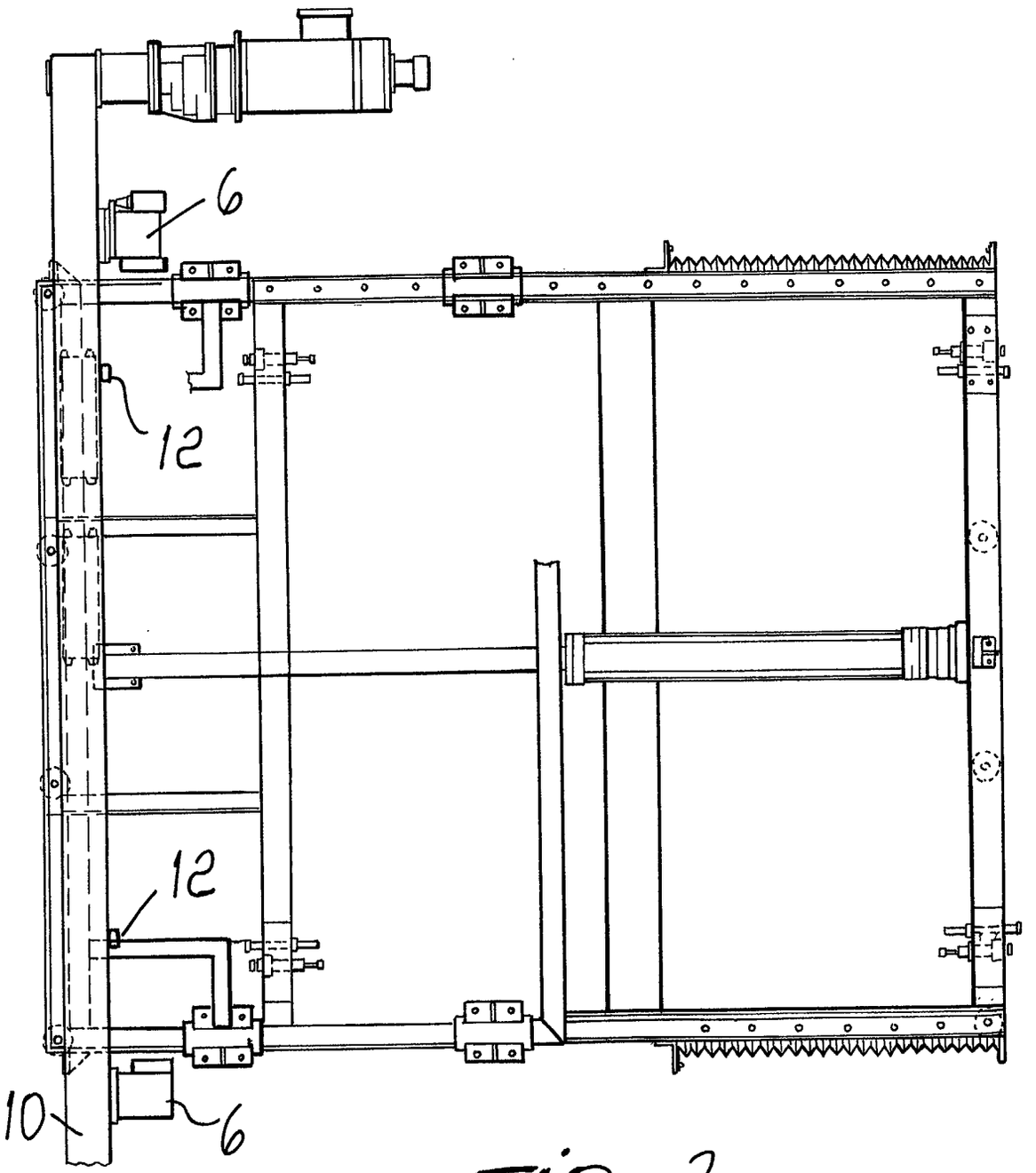

Fig. 2

Fig. 3