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(71) Applicant: **Gambini International S.A.**
2449 Luxembourg (LU)

(72) Inventor: **Gambini, Giovanni**
56100 PISA (IT)

(74) Representative: **Martini, Gabriele**
Barzanò & Zanardo Milano S.p.A.
Via Borgonuovo, 10
20121 Milano (IT)

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(54) **Machine for producing a tubular element by winding in a spiral at least one strip of cardboard**

(57) Machine for producing a tubular element by winding in a spiral at least one strip of cardboard (11) carrying glue; said machine comprising a winding unit (12) of said at least one continuously supplied strip of cardboard, a winding pin (13) on which a partially overlapped spiral of said at least one strip of cardboard (11) is wound, wherein said winding unit (12) comprises a winding belt (16) returned by two pulleys (17) arranged on opposite sides with respect to said winding pin (13), said winding belt (16) returned by said pulleys (17) so as to form a loop or knot around said at least one strip of cardboard, wherein a pressing unit (30) is provided acting under pressure externally selectively against said belt (16) at said loop or knot to press said belt (16) against said at least one strip of cardboard.

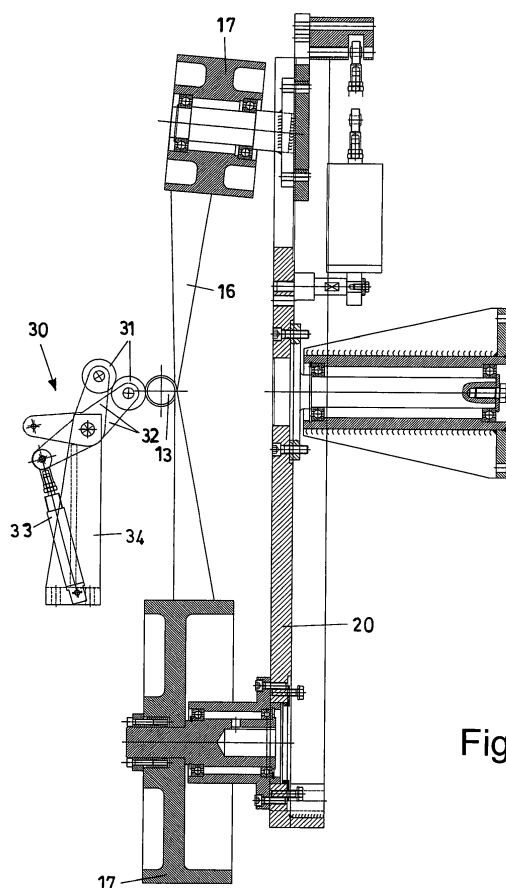


Fig.2

Description

[0001] The present invention refers to a machine for producing a tubular element by winding in a spiral at least one strip of cardboard.

[0002] In addition, the present invention refers to a method for obtaining the aforementioned cardboard tube.

[0003] In particular, the present invention refers to the production of tubular elements intended to be cut to size to be used as an inner support, or core, in toilet paper rolls, kitchen paper rolls, adhesive tape rolls or other products.

[0004] Machines for producing cardboard tubes are currently known in the industry as "corewinder" comprising a unit for winding one or more strips of cardboard about a pin element.

[0005] The winding unit is commonly formed by a belt returned by two pulleys which have a rotational axis identical with the axis of the pin according to an angle preferably different from the right angle. At least one branch of the belt is loop-wound about the pin to tighten on the latter at least part of a superimposed portion of the at least one strip of cardboard being wound.

[0006] In other words, the belt forms around the at least one strip being wound on the pin substantially a "knot" which slides with respect to the tube being formed advancing on the pin.

[0007] Should the tube be made by winding a single strip of cardboard, the knot of the belt acts on a superimposed portion of two successive turns of the common strip.

[0008] In the case in which the tube is made by winding two strips of cardboard, the knot of the belt acts on a superimposed portion of the two belts.

[0009] In order to maintain stable the at least one spiral wound strip, glue is provided arranged at the superimposed portions of the at least one strip.

[0010] In making such tubes, it is fundamental to be able to exert on the tube being formed a correct pressure so as to allow the correct gluing of the cardboard turns forming the tube.

[0011] Actually, and disadvantageously, an excessive tension on the tube being wound may result in too much friction on the pin while insufficient tension may cause the incomplete gluing and a gluing such to cause in the cutting step the detachment of the tip ends not properly glued.

[0012] Improper gluing prevents a correct supply of the tube portions, or cores, to other machines, for example a reeling machine.

[0013] In addition, it should be observed that the correct pressure to be exerted on the tube being made acquires greater importance in tubes made by winding a single strip where, for obvious reasons, the area where the glue is deposited has smaller dimensions.

[0014] In other words, the presence of a smaller zone for gluing and superimposing the strips, makes the need

to exert a correct pressure to the tube being made more important.

[0015] Two solutions to such problem are currently known.

5 **[0016]** Such solutions provide for the use of a hot glue or the introduction, into the machine, of proper devices adapted to impart a pressure on the tube being made. However, both aforementioned solutions reveal drawbacks.

10 **[0017]** The hot glue is very expensive even due to the fact that it cannot be recycled.

[0018] The devices adapted to impart a further pressure to the currently known tubes provide for the use of wheels, smooth or knurled, acting under pressure directly at contact with the tube being made downstream of the knot of the belt.

15 **[0019]** Such wheels have the problem related to the wear of the spindle, due to extremely localised pressure, and problems generated by the interference of the pressure wheel with the tube being made.

[0020] The object of the present invention is to provide a machine for producing a tubular element for winding in a spiral at least one strip of cardboard that is alternative to the current known ones.

25 **[0021]** Another object of the present invention is to provide a corewinder particularly adapted to provide tubes made by winding a single strip.

[0022] Generally, the invention attains the objects outlined above by providing pressing means acting on the knot of the belt, and not on the tube, so as to variably compress the belt against the strip being wound on the pin.

30 **[0023]** A preferred embodiment provides the presence of an idle roller which is moveable between a contact position tangential to the belt and a spaced apart position.

[0024] In addition, the contact pressure may be modulated so as to impart various pressures on the belt depending on the needs.

35 **[0025]** These objects, according to the present invention, are attained by providing a machine for producing a tubular element by winding in a spiral at least one strip of cardboard as outlined in claim 1.

[0026] Further characteristics of the machine and the relative method are provided in the dependent claims.

40 **[0027]** The characteristics and advantages of a machine for producing cardboard tubes according to the present invention and a relative method shall be more apparent from the following exemplifying but non-limiting description with reference to the attached schematic drawings wherein:

figure 1 and 2 are front and side elevation views of an embodiment of a corewinder according to the present invention;

45 figures 3 and 4 are partial perspective views of the machine of figures 1 and 2.

[0028] With reference to the figures, a machine for pro-

ducing cardboard tubes, indicated in its entirety with 10, is shown comprising a winding unit 12 and a winding pin 13.

[0029] A strip of cardboard 11 is supplied carrying glue to the machine 10 continuously according to the known methods.

[0030] The machine 10 receives the strip of cardboard 11 at the winding unit 12 aimed at providing a tube 11 around a per se known pin element 13.

[0031] The winding pin 13 is mounted cantilevered on a head 15 of the machine 10 for example with horizontal axis. It may be fixed or idle so as to be able to rotate during the production of the cardboard tube 11.

[0032] The winding unit 12 comprises a winding belt 16 returned by two pulleys 17, at least one of which 18 is preferably motorised.

[0033] The line that joins the centres of the two pulleys 17 forms an incidence angle with respect to the pin 13 different from the right angle and it may be modified at will, for example by acting on a flywheel 21.

[0034] As known, the winding belt 16 is wound loop-like around the pin 13, to compress the strip of cardboard 11 being wound partially superimposed in a spiral on the pin 13. The winding belt 16 substantially forms a "knot" which slides with respect to the tube 11 being formed which advances on the pin 13.

[0035] The tension of the winding belt 16 may be regulated by, for example, a relative movement of a pulley 17 on the plate 20.

[0036] According to the invention, in the machine 10, and in particular at the knot of the belt 16, at least one pressing unit 30 is provided acting on the belt 16 configured for variably compressing it against the strip 11 being wound on the pin 13 as desired.

[0037] Thus, according to the invention, the pressing unit 30 acts on the strip 11 being wound on the pin indirectly and through the belt 16.

[0038] In the shown embodiment, the pressing unit 30, which may act on the belt 16 both on the side of the plate 20 and on the opposite side of the pin 13, comprises a roller element 31 idly mounted on a linkage 32 actuated by a pneumatic cylinder 33.

[0039] The linkage 32, which is moveable under the action of the pneumatic cylinder 33 between a position in which the roller element 31, presses against the belt 16 and a position in which it is distant from the same.

[0040] In the contact position the roller 31 may act under pressure against the belt 16 according to compression values that are variable and controllable by the pneumatic cylinder 33.

[0041] Such pneumatic cylinder 33 is controlled by a control unit (not shown).

[0042] The linkage 32 is hinged on a bracket 34 fixed to the plate 12, which bracket supports an end of the pneumatic cylinder 33.

[0043] The axis 35 of the roller 31 may be parallel to the axis of the pin 13, or inclined or adjustable in inclination as illustrated with F in figure 4.

[0044] The method for producing cardboard tubes by means of the machine 10 according to the invention provides for the known steps of:

- 5 - feeding a strip of cardboard 11 carrying glue along an edge to the winding unit 12,
- winding in a spiral and tightening, or compressing, the strip of cardboard on the pin 13 to obtain the cardboard tube 11.

[0045] According to the invention, the machine 10 performs the step of compressing the strip of cardboard 11 against the pin 13 acting under pressure against the belt 16 at the knot thereof around the at least one strip being wound on the pin 13.

[0046] The machine described up to date refers to a machine of the type supplied by only one strip 11.

[0047] However, the present invention, which identifies its inventive concept with the particular pressing unit 30 acting on the belt 16 and not on the tube 13, can also be applied to machines supplied by two or more strips. In such case, the strips of cardboard shall be simply wound on the pin in a spiral staggered with respect to each other, i.e. parallel and partially superimposed. These strips of cardboard shall be glued to each other at the superimposed edges thereof.

[0048] On the contrary, in the single strip 11 embodiment the latter is supplied so that the portion of the turn being wound is at least partially superimposed to the same strip 11 previously wound on the pin 13.

[0049] The machine for producing cardboard tubes subject of the present invention and the relative method have the advantage of improving the gluing thus preventing the formation of unglued tips in the step of cutting the cardboard tube and making the gluing independent from the angle of the propeller making the tube.

[0050] This is briefly due to the fact that the pressing unit is not at contact with the tube but with the belt, which absorbs fairly well possible peripheral speed differences with the pressing unit itself.

[0051] The corewinder thus conceived is susceptible to many modifications and variants, all falling within the scope of the invention; furthermore, all details can be replaced by technically equivalent elements. In practice, the materials used, as well as the dimensions, may vary according to the technical requirements.

Claims

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1. Machine for producing a tubular element by winding in a spiral at least one strip of cardboard (11) carrying glue; said machine comprising a winding unit (12) of said at least one strip of cardboard (11) continuously fed, a winding pin (13) whereon said at least one strip of cardboard (11) is wound in a partially overlapped spiral, wherein said winding unit (12) comprises a winding belt (16) returned by two pulleys

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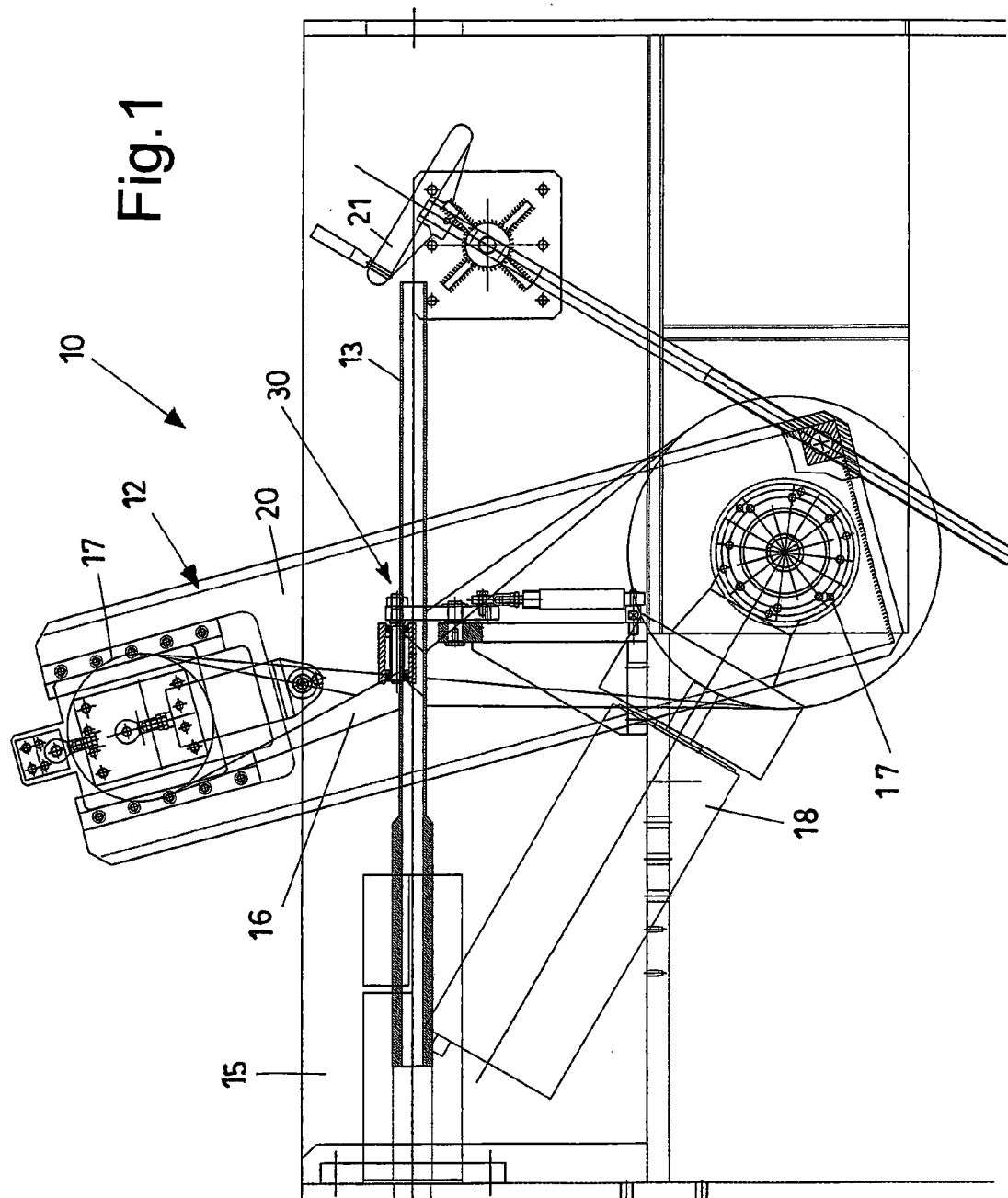
(17) arranged on opposite sides with respect to said winding pin (13), said winding belt (16) returned by said pulleys (17) so as to form a loop or a knot around said at least one strip of cardboard (11) winding on said pin (13), **characterized in that** it comprises a pressing unit (30) acting under pressure externally selectively against said belt (16) at said loop or knot in order to press said belt (16) against said at least one strip of cardboard (11) winding on said pin (13).

2. Machine (10) according to claim 1 **characterized in that** said pressing unit (30) is configured for imparting varying pressures on said belt (16) at said loop or knot. 5
3. Machine (10) according to any of the preceding claims **characterized in that** said pressing unit (30) comprises a roller element (31) which is movable between a tangential contact position with said belt (16) and a distanced position from said belt (16). 10 20
4. Machine (10) according to claim 3 **characterized in that** said roller element (31) is idly mounted on a linkage (32) actuated by a pneumatic cylinder (33). 25
5. Machine (10) according to claim 4 **characterized in that** said pressing unit (30) comprises a bracket (34) fixed to said plate (20) supporting said linkage (32) and said pneumatic cylinder (33). 30
6. Machine (10) according to claim 3 **characterized in that** said roller (31) has an axis (35) parallel to the axis of said pin (13) or an axis (35) inclined with respect to the axis of said pin (13) or axis (35) inclinable in a variable manner with respect to the axis of said pin (13). 35
7. Method for producing cardboard tubes by means of a tube machine (10) according to any of the preceding claims, comprising the steps of: 40
 - feeding at least one strip of cardboard (11) carrying glue;
 - winding in a spiral said at least one strip of cardboard (11) around a pin (13) in a manner at least partially overlapped; 45
 - pressing said at least one strip of cardboard (11) winding around said pin (13); said step being carried out by winding as a loop or knot a belt (16) returned by pulleys (17) around said at least one strip of cardboard (11) winding on said pin (13); 50

characterized in that the step of pressing said at least one strip of cardboard (11) winding around said pin (13) comprises in addition the step of selectively pressing said belt against said at least one strip of cardboard (11) winding on said pin (13) at said loop 55

or knob.

8. Method according to claim 7 **characterized in that** said step of pressing against said belt is feasible according to different pressures.
9. Method according to claim 7 **characterized in that** said step of pressing against said belt is carried out by selective approach into contact with a roller element (31) against said belt (16).
10. Method according to claim 7 **characterized in that** said selective approach of said roller element (31) is carried out through linkage (32) actuated by a pneumatic cylinder (33).



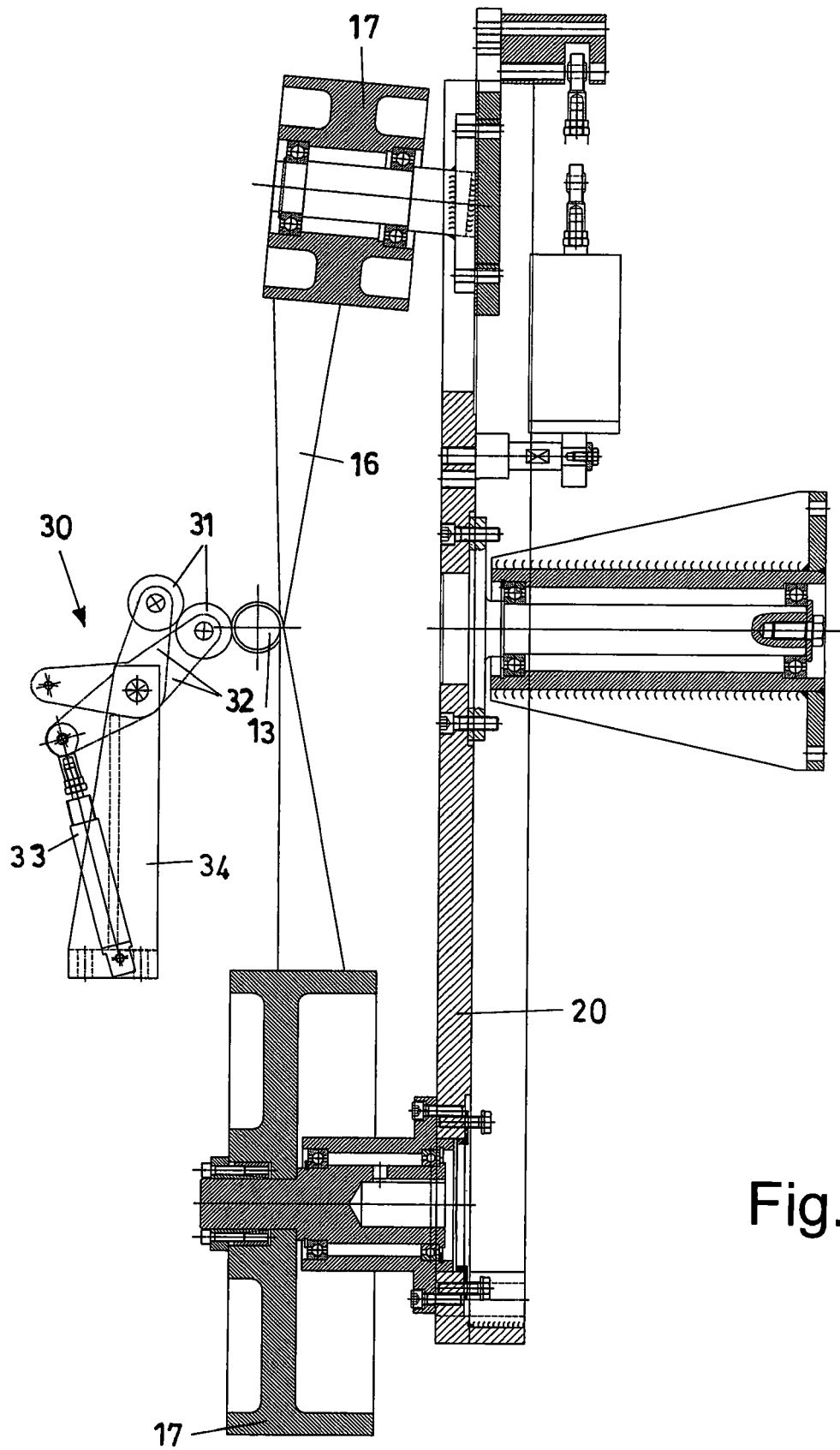
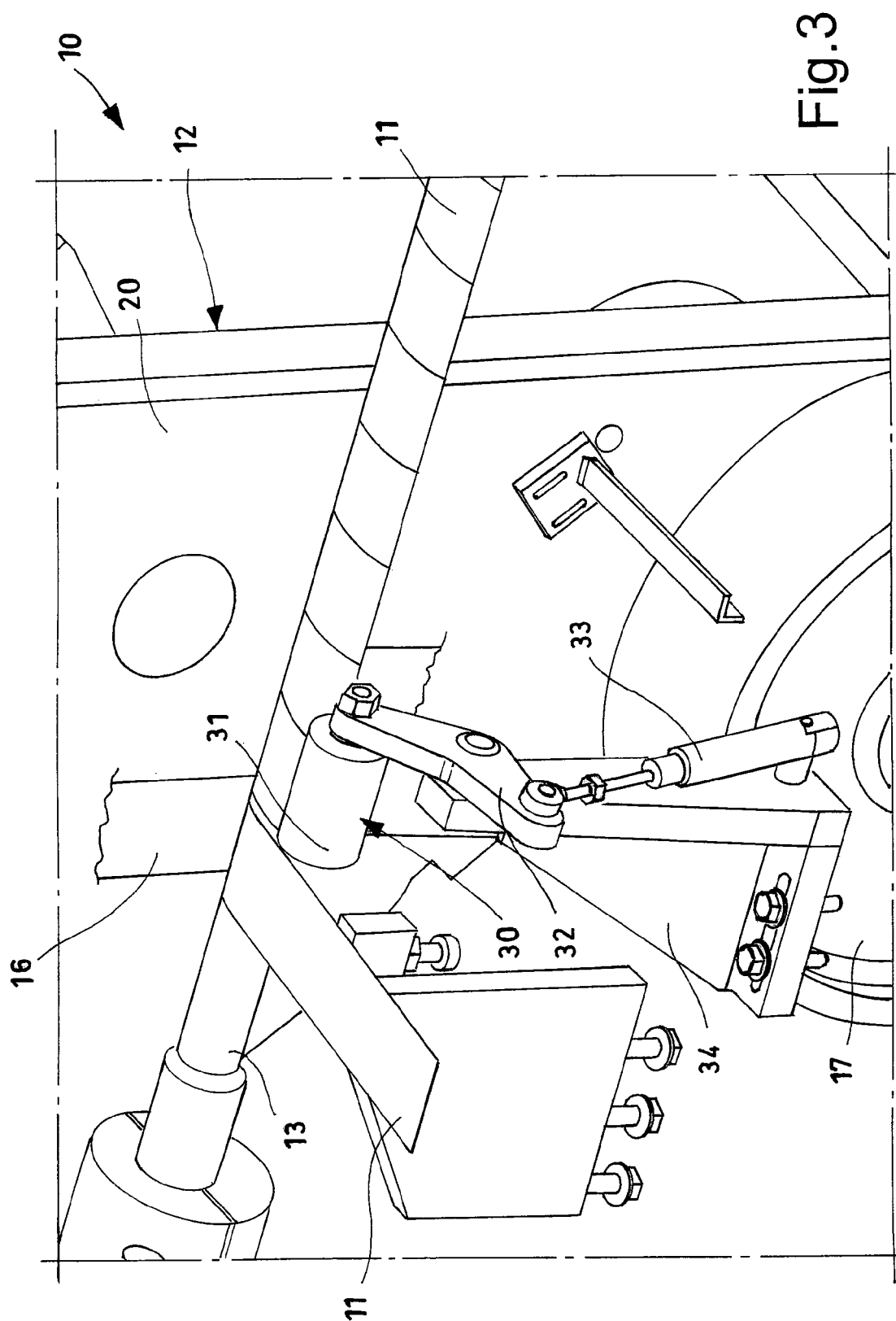


Fig.2



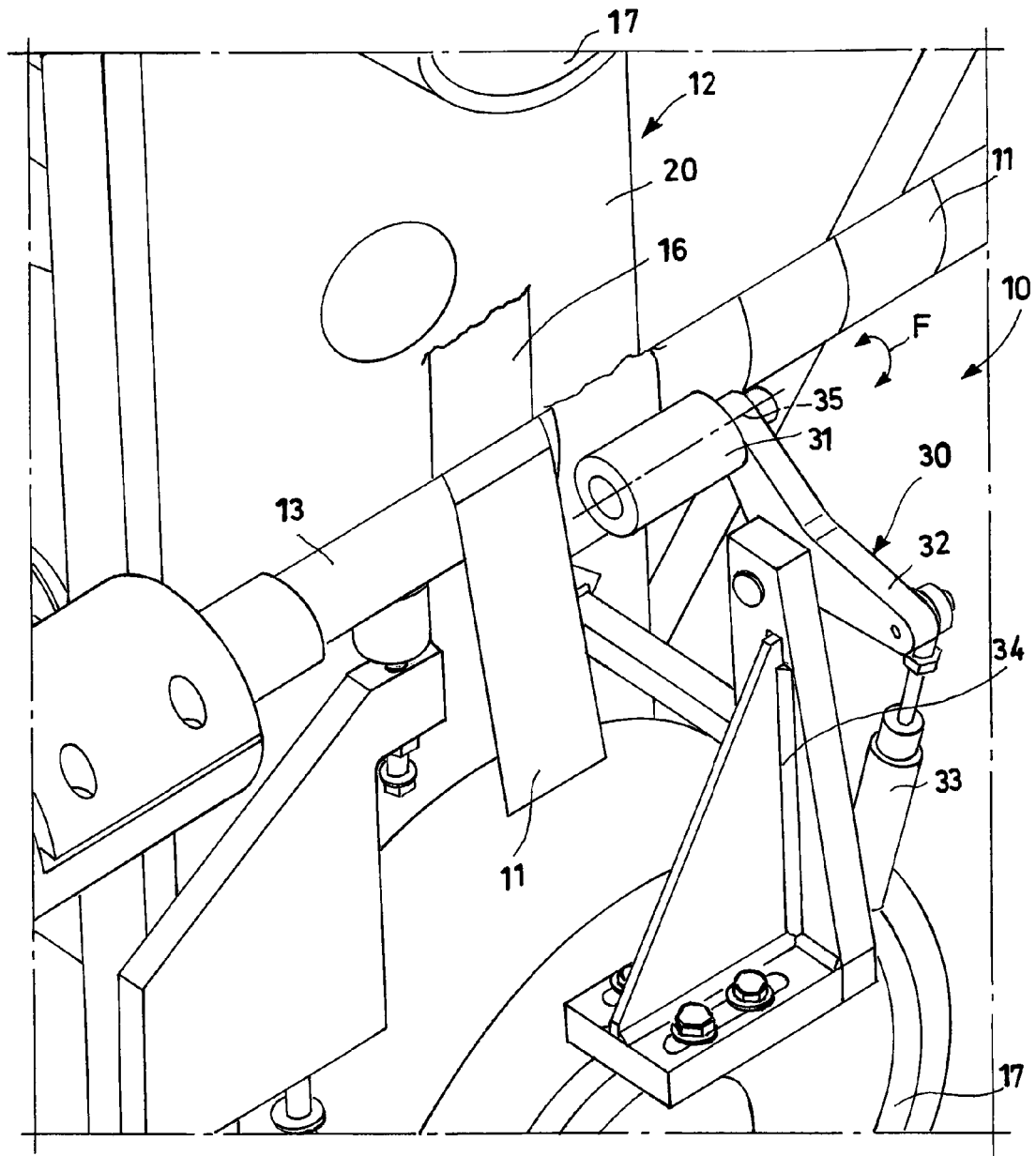


Fig.4



EUROPEAN SEARCH REPORT

Application Number
EP 14 16 5295

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2 931 278 A (IGNELL ROLF L) 5 April 1960 (1960-04-05)	1-3,6-8	INV. B31C3/00
A	* column 1, line 72 - column 2, line 28; claim 1; figures 4, 5 * * column 4, line 13 - line 24 * * column 4, line 52 - line 53 * -----	4,5,9,10	
			TECHNICAL FIELDS SEARCHED (IPC)
			B31C
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 27 August 2014	Examiner Sundqvist, Stefan
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			

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