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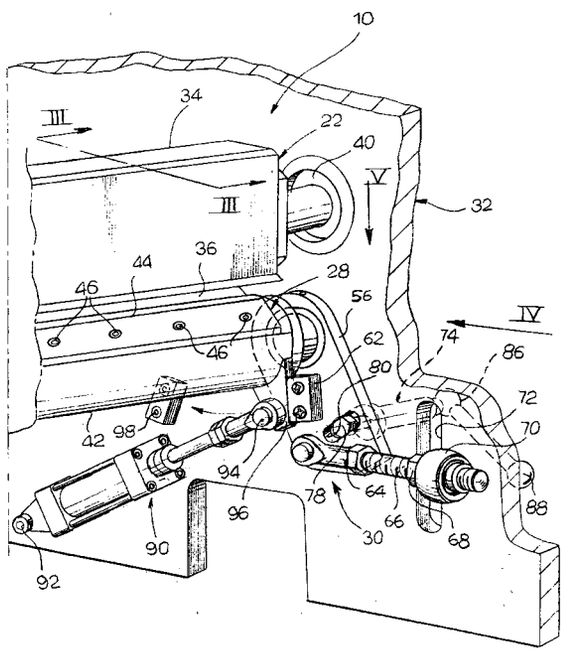
(54) Foil cutting assembly, in particular for a wrapping machine

(57) A foil cutting assembly, in particular for a wrapping machine, comprising:

- a fixed knife (28) and a rotating knife (22), having respective blades (44, 36) cooperating with each other, and
- adjustment means for varying the interference between the fixed knife (28) and the rotating knife (22).

The fixed knife (28) is rotatably mounted about an axis (50) parallel to the axis of rotation of the rotating knife (22) and said adjustment means are provided for varying the angular operating position of the fixed knife (28).

Fig. 2



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Description

[0001] The present invention relates to a foil cutting assembly, designed in particular to carry out a cut at regular intervals on a film of plastics material which is movable from a roll towards a wrapping station.

[0002] A cutting assembly is known, including a fixed knife and a rotating knife, cooperating with each other for cutting at a predetermined intervals a foil passing through such knives. The knives comprise respective blades which interfere with each other and the blade of the rotating knife during its rotating movement cooperates with the blade of the fixed knife, so as to cut the foil in a direction transversal to the direction of movement of the foil. Cutting assemblies of this type can operate both with thin bimetallic blades and with normal blades.

[0003] One of the main problem of the cutting assemblies of this type is represented by the fact that during operation the blades wear out because of the reciprocal contact. Such wear compromises the cutting efficiency of the assembly and for maintaining constant the cutting quality it is necessary to periodically adjust the interference between the blades of the knives.

[0004] In the known solutions, the adjustment of the interference between the blades is a very complex and delicate operation which requires a particularly skilled operator and can be carried out only when the machine is not operating.

[0005] The object of the present invention is to provide an improved cutting assembly which overcomes such problems.

[0006] According to the present invention, this object is achieved by a cutting assembly having the features forming the subject of the main claim.

[0007] Characteristics and advantages of the present invention will become clear in the course of the detailed description which follows, given purely by way of non-limiting example, with reference to the attached drawings, in which:

- figure 1 is a lateral schematic view of a cutting assembly according to the present invention,
- figure 2 is a partial perspective view showing the adjustment device of the cutting assembly according to the invention,
- figure 3 is a cross-section ta-ken along the line III-III of figure 2,
- figure 4 is a partially sectioned front view taken along the arrow IV of figure 2,
- figure 5 is a partially sectioned plan view taken along the arrow V of figure 2, and
- figure 6 is a partial perspective view showing a variant of a cutting assembly according to the invention.

[0008] With reference to figure 1, the numeral reference 10 indicates a cutting assembly intended to cut at regular intervals a foil of plastics material 12 coming from a roll 14. The foil 12 passes between a pair of unwinding rollers 16 and through the cutting assembly 10 which cuts the foil in a direction orthogonal to the direction of movement thereof. In a way per se known, the cut is interrupted in some points for forming continuity zones between the section of the foil upstream and downstream of the transversal cutting line. Downstream of the cutting assembly 10, the foil 12 is grasped along its longitudinal edges by a known dragging device 18 including, along each edge of the foil, a pair of belts 20 which drag the foil 12 in the direction indicated by the arrow A. The continuity zones which join to each other the adjacent sections of the foil 12 are torn downstream of the cutting assembly 10 for forming individual sections of wrapping foils which are fed to a wrapping machine. The way in which the single section of the foil are torn is per se known and does not fall in the scope of the present invention. Referring always to figure 1, the cutting assembly 10 comprises a rotating knife 22 rotatable about an axis orthogonal to the direction of movement of the foil 12. The rotating knife 22 is rotated by and electric motor 24 by means of a flexible transmission member 26 formed, for instance, by a toothed belt or by a chain. The rotating knife 22 cooperates with a fixed knife 28 which is associated with a mechanism 30 for adjusting the interference between the knives 26, 28.

[0009] With reference to figure 2 to 5, the cutting assembly 10 is carried by a fixed support structure including a pair of sturdy lateral shoulders 32 parallel to each other. The rotating knife 22 comprises a beam 34 with a rectangular cross-section, on which a blade 36 is fixed by means of screws 38 (figure 3). The beam 34 is rotatably carried by the shoulders 32 by means of roller bearings 40. The blade 36 of the rotating knife 32 is formed by a thin steel lamina which is mounted on a helically shaped surface of the beam 34. The flexible blade 36 assumes therefore the same shape of the helical surface against which it is pushed by the screws 38.

[0010] The fixed knife 28 comprises a support 42 having a tubular shape. On the outer, surface of the support 42 a flat surface is formed, on which a blade 44 is fixed by means of screws 46. The support 42 of the fixed knife 28 is connected to the shoulders 32 by means of roller bearings 48 which permit the rotation of the fixed knife 28 about an axis 50 parallel to the axis of rotation of the rotating knife 22. The axis of rotation 50 is preferably eccentric with respect to the axis of the tubular support 42. As shown in particular in figures 4 and 5, the bearing 48 on the right side is carried by an intermediate support element 52 having a portion 54 coaxial with the axis 50, on which a plate 56 is rotatably mounted. The portion 54 has a circumferential groove 58 on its outer surface, which is engaged with play by the end of a screw 60 carried by the blade 56. The screw 60 and the circumferential groove 58 serve to connect the plate 56 to the intermediate support element 52 leaving however the plate 56 free to rotate about the same axis 50 about which the fixed knife 28 is rotatable. The plate 56 carries

a stop element 62 formed by a block projecting from a lateral surface of the plate 56 (figure 2).

[0011] The plate 56 and the stop element 62 form part of the adjustment device 30 which varies the interference between the blade 36 of the rotating knife 22 and the blade 44 of the fixed knife 28. The adjustment device 30 further comprises a tie rod 64 articulated to the plate 56 about an axis parallel to said axis 50 about which the plate 56 is rotatable. The tie rod 64 has a threaded portion 66 which engages a nut 68 having a hexagonal portion which can be engaged by a spanner. The nut 68 is free to rotate about its own axis inside a bush 70 which is articulated to the shoulder 32 about an axis parallel to the articulation axis of the other and of the tie rod 64. The hexagonal portion of the nut 68 is placed in correspondence with an elongated aperture 72 formed in the shoulder 32, through which a spanner can be inserted for rotating the nut 68. It will be understood that the rotation of the nut 68 produces the rotation of the plate 56 about its own axis of rotation 50 and such rotation modifies the angular position of the stop element 62.

[0012] For preventing undesired accidental movements of the plate 56, a locking device 74 is provided, including a tie rod 76 having a square or hexagonal head 78 which engages without possibility to rotate an elongated seat 88 formed in the plate 56. The tie rod 76 extends through a slot 82 formed in the shoulder 32 and through a bush 84. The end of the tie rod coming out from the bush 84 engages the nut 86 of a locking and unlocking lever 88. By rotating the lever 88 in the direction corresponding to the tightening of the nut 86 on the tie rod 76, the head 78 of the tie rod rests against the bottom wall of the seat 80 and pushes the plate 56 against the shoulder 32 thereby locking the plate 56 against rotation. When an adjustment has to be carried out, the lever 88 is rotated in the direction corresponding to unscrewing the nut 86 from the tie rod 76 and in this manner the pressure pushing the plate 56 against the shoulder 32 is eliminated. After having unlocked the plate 56, it is possible to vary its angular position by acting on the nut 68. The head 78 of the tie rod 76 remains stationary inside the seat 80 but does not obstruct the rotation of the plate 56 by virtue of the elongated shape of the slot 82.

[0013] Up to now the part of the adjustment device 30 which enables variations of the angular position of the plate 56 carrying the stop element 62 has been disclosed. However, the plate 56 can rotate about the axis 50 independently of the fixed knife 68, so that the rotation of the plate 56 about the axis 50 does not produce automatically a rotation of the knife 28. In accordance with a preferred embodiment of the present invention, the adjustment device 30 comprises a fluid actuator 90 which constantly pushes the support 42 of the fixed knife 28 against the stop element 62. The actuator 90 has a first end 92 articulated to the shoulder 32 and a second end 94 articulated to a flange 96 fixed to the support 42 and radially projecting therefrom. In normal operating conditions, the actuator 90 applies a force to the flange 96 tending to maintain the flange 96 constantly in contact with the stop element 62. As shown in figures 2 and 3, the adjustment device 30 comprises a second stop element 98 fixed to the shoulder 32, which defines an inoperative position of the knife 28 which is particularly useful for carrying out the replacement of the blade 44.

[0014] The operation of the previously disclosed device is the following.

[0015] In normal operating conditions of the cutting assembly 10, the plate 56 is locked against the shoulder 32 by means of the locking device 74. The actuator 90 pushes the flange 96 against the stop element 62 and maintains the knife 28 in a fixed angular position. During the operation of the cutting assembly 10, the blade 38 of the rotating knife 22 contacts the blade 44 of the fixed knife 28 during each rotation of the rotating knife 34, thereby producing the transversal cut of the foil 12 which moves between the two knives. The flexibility of the blades 36 and 44 permits to the knives 22 and 28 to operate in conditions of mutual interference. However, such interference produces a wear of the blades which requires a periodic adjustment of the interference between the knives. For carrying out such adjustment, the operator unscrews the locking device 74 and rotates the nut 68 by means of a spanner. Such rotation of the nut 68 produces, as previously disclosed, a rotation of the plate 56 which varies the angular position of the stop element 62. The actuator 90 automatically pushes the fixed knife 28 against the stop element 62 while it moves to the new position. Therefore, the fixed knife 28 rotates about the axis 50 of an angle equal to the angular movement of the plate 56. The rotation of the knife 28 produces a variation of the interference conditions between the blade 36 and 44. When the desired interference conditions are reached, the adjustment is finished and the blade 56 is locked in the new position by means of the locking device 74.

[0016] An important feature of the present invention consists in that the adjustment operation previously disclosed can be carried out also when the machine is running. Therefore, the result of the adjustment can be immediately perceived by the operator in terms of quality of the cut. As soon as the quality of the cut reaches the desired level, the operator has a confirmation of the fact that the adjustment has been correctly carried out. Therefore, the adjustment operation does not involve a stop of the machine and can be carried out very rapidly even by operators not particularly skilled.

[0017] A second particularly important feature is that the adjustment device including the tie rod 66, the plate 56 and the eccentric support 28 permits micrometric movements of the blade 44 and gives a very high adjustment precision.

[0018] When the blade 44 must be replaced, the machine is stopped and the actuator 90 is brought in a retracted position in which the flange 96 abuts against the second stop element 98. The fixed knife moves there-

fore to a position in which the replacement of the blade 44 can be carried out much more easily.

[0019] Figure 6 shows a variant of the cutting assembly according to the invention, in which the elements corresponding to the ones disclosed above are indicated by the same numeral references. In the variant of figure 6, the fixed knife 28 carries a second flange 100 opposite to the first flange 96. With respect to the embodiment disclosed above, the actuator 90 has been moved on the opposite shoulder 32 and has a first end 92 articulated to the shoulder 32 and a second end 94 articulated to the second flange 100. In this manner, the fixed knife 28 is subject to a torsional load produced by the force of the actuator 90 which acts on the stop element 62 carried by the first flange 56. The torsional load on the fixed knife 28 compensates possible plays.

[0020] As a further alternative, the assembly according to the invention could be provided with two actuators placed in correspondence with both ends of the fixed knife 28.

Claims

1. A foil cutting assembly, in particular for a wrapping machine, comprising:

- a fixed knife (28) and a rotating knife (22), having respective blades (44, 36) cooperating with each other, and
- adjustment means for varying the interference between the fixed knife (28) and the rotating knife (22),

characterized in that the fixed knife (28) is rotatably mounted about an axis (50) parallel to the axis of rotation of the rotating knife (22) and in that said adjustment means are provided for varying the operating angular position of the fixed knife (28).

2. An assembly according to claim 1, characterized in that said adjustment means (30) comprises at least one threaded member (66, 68) adapted to control a variation of the operating position of the fixed knife (28).

3. An assembly according to claim 2, characterized in that said threaded element (66, 68) is adapted to vary the angular position of a stop element (62) and in that the adjustment device comprises means (90) for pushing the fixed knife (28) in a position of abutment against said stop element (62).

4. An assembly according to claim 3, characterized in that said stop element (62) is carried by a plate (56) which can rotate about the same axis of rotation of the fixed knife (28).

5. An assembly according to claim 3, characterized in that it comprises a fluid actuator (90) arranged for pushing the fixed knife (28) against said stop element (62).

6. An assembly according to claim 5, characterized in that said fluid actuator (90) is also provided for bringing the fixed knife (28) in an inoperative position for replacing the blade (44).

7. An assembly according to claim 4, characterized in that it comprises a locking device (74) for maintaining said stop element (62) in a steady operating position.

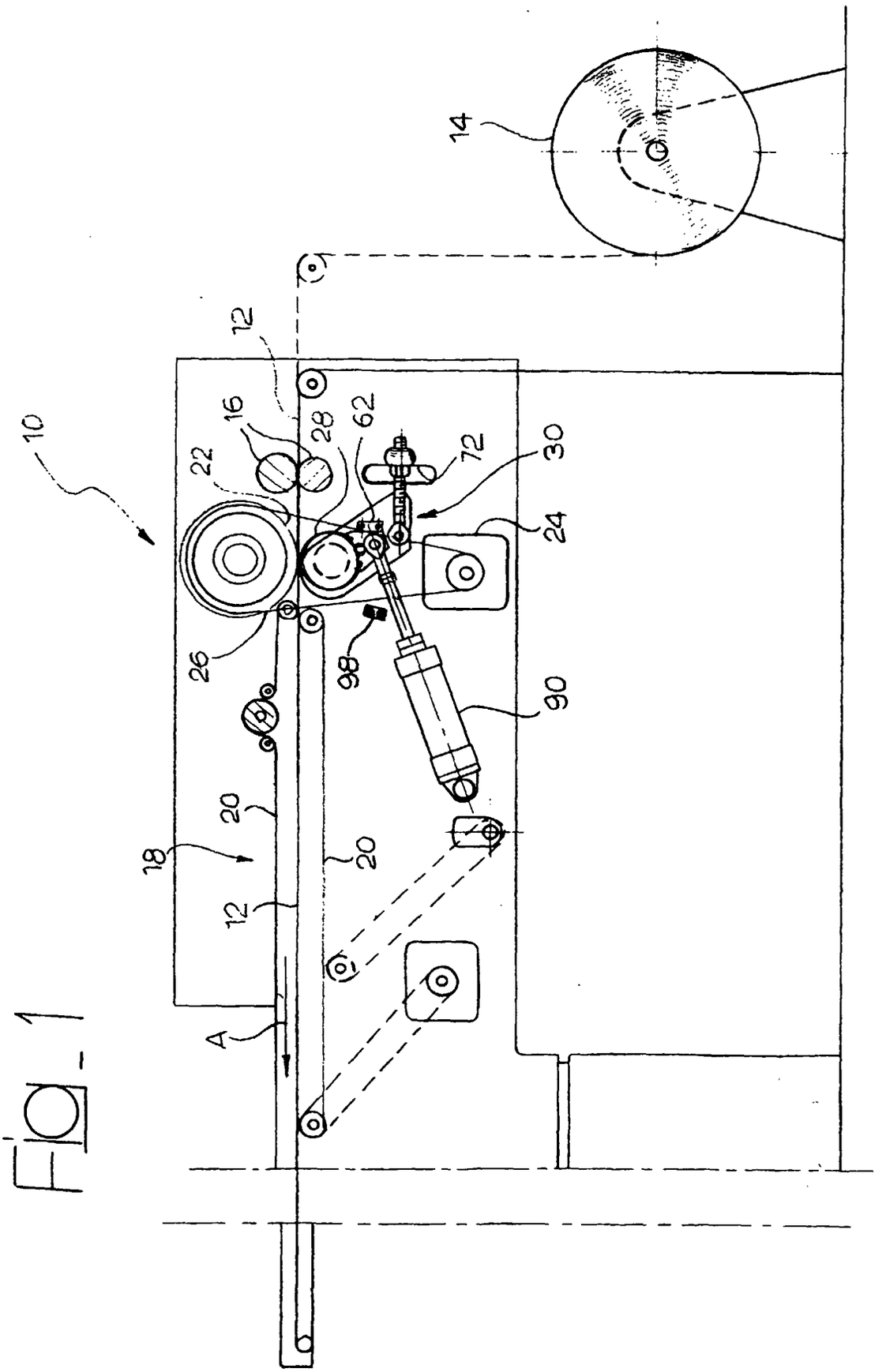
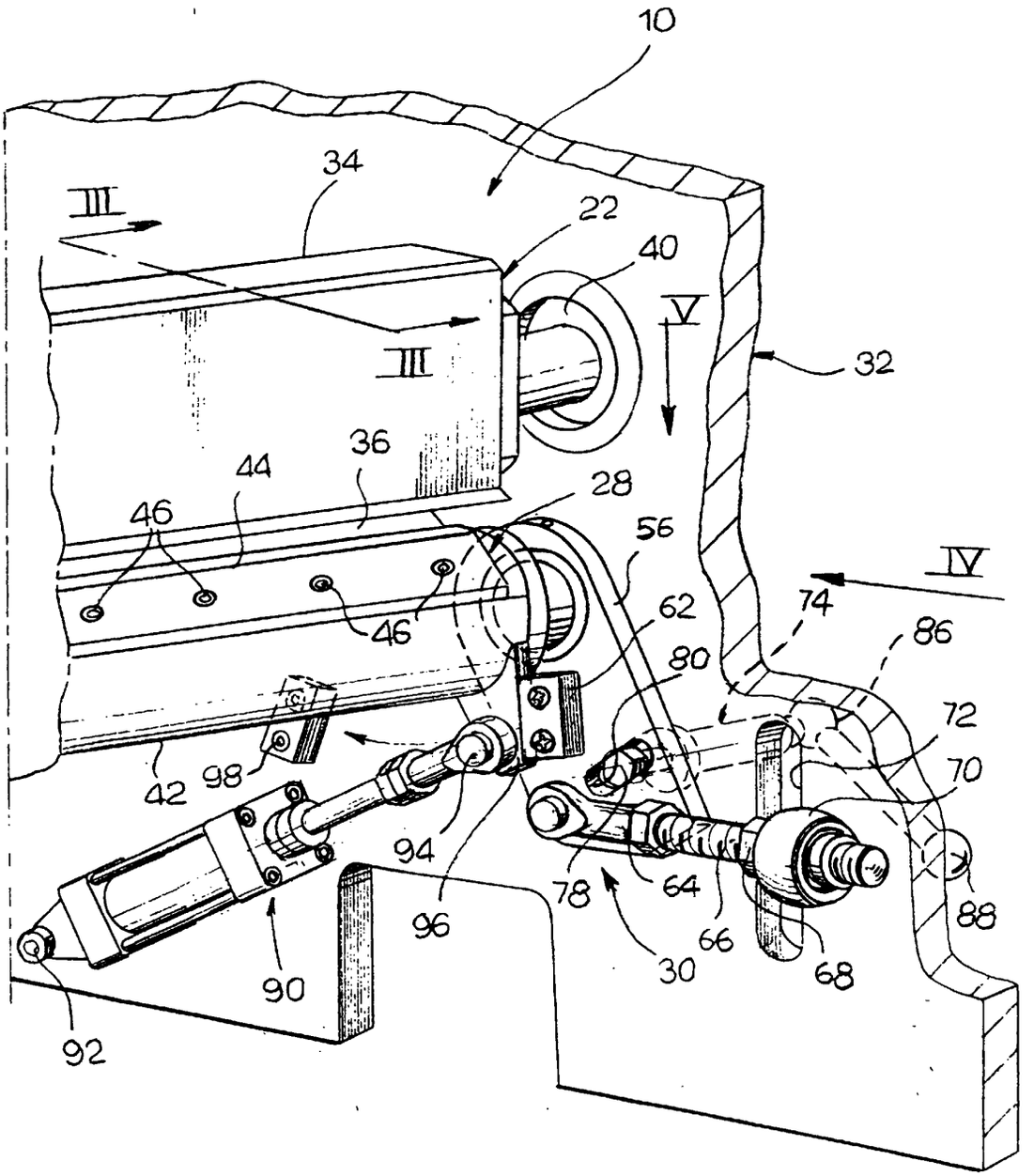


FIG. 1

Fig_2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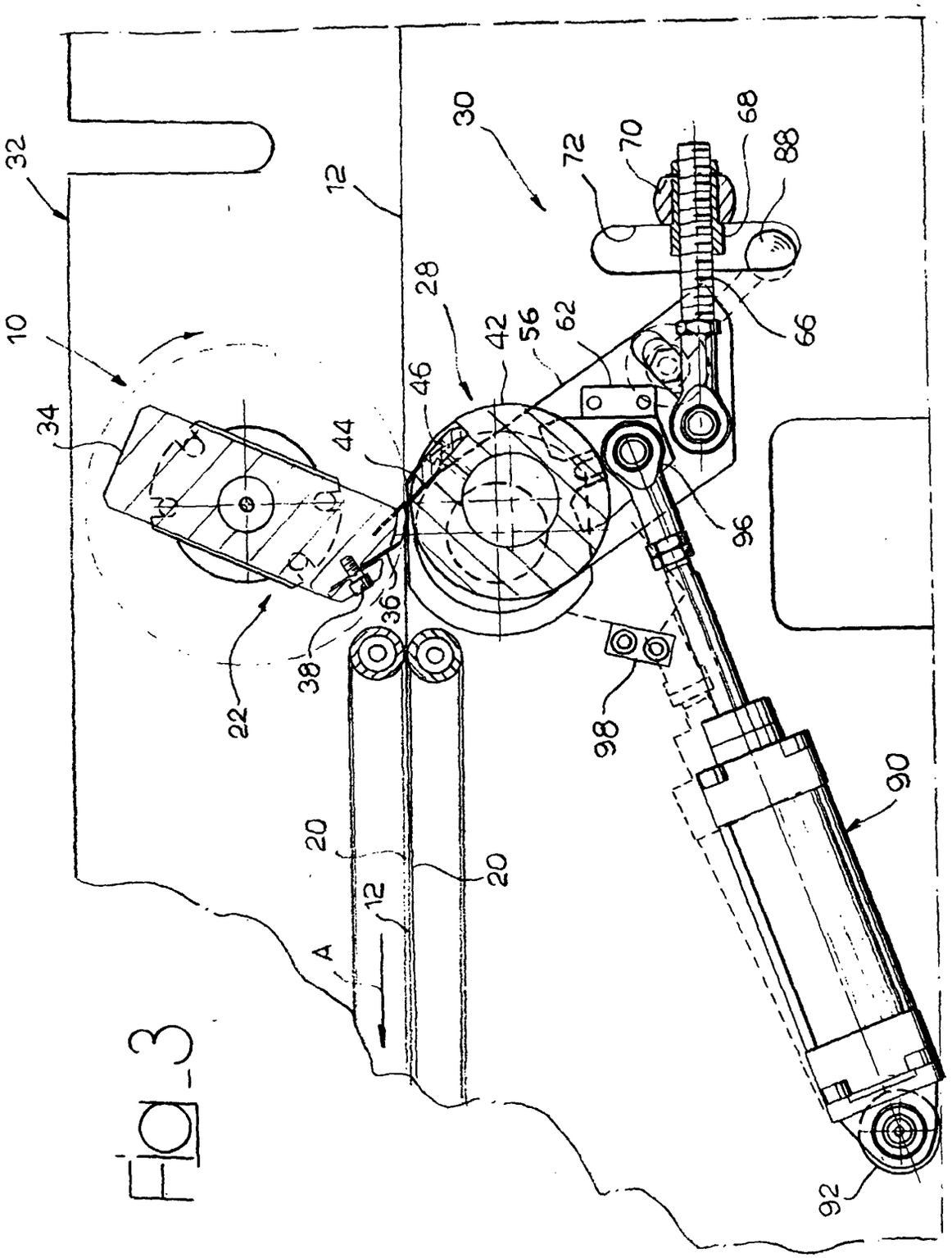
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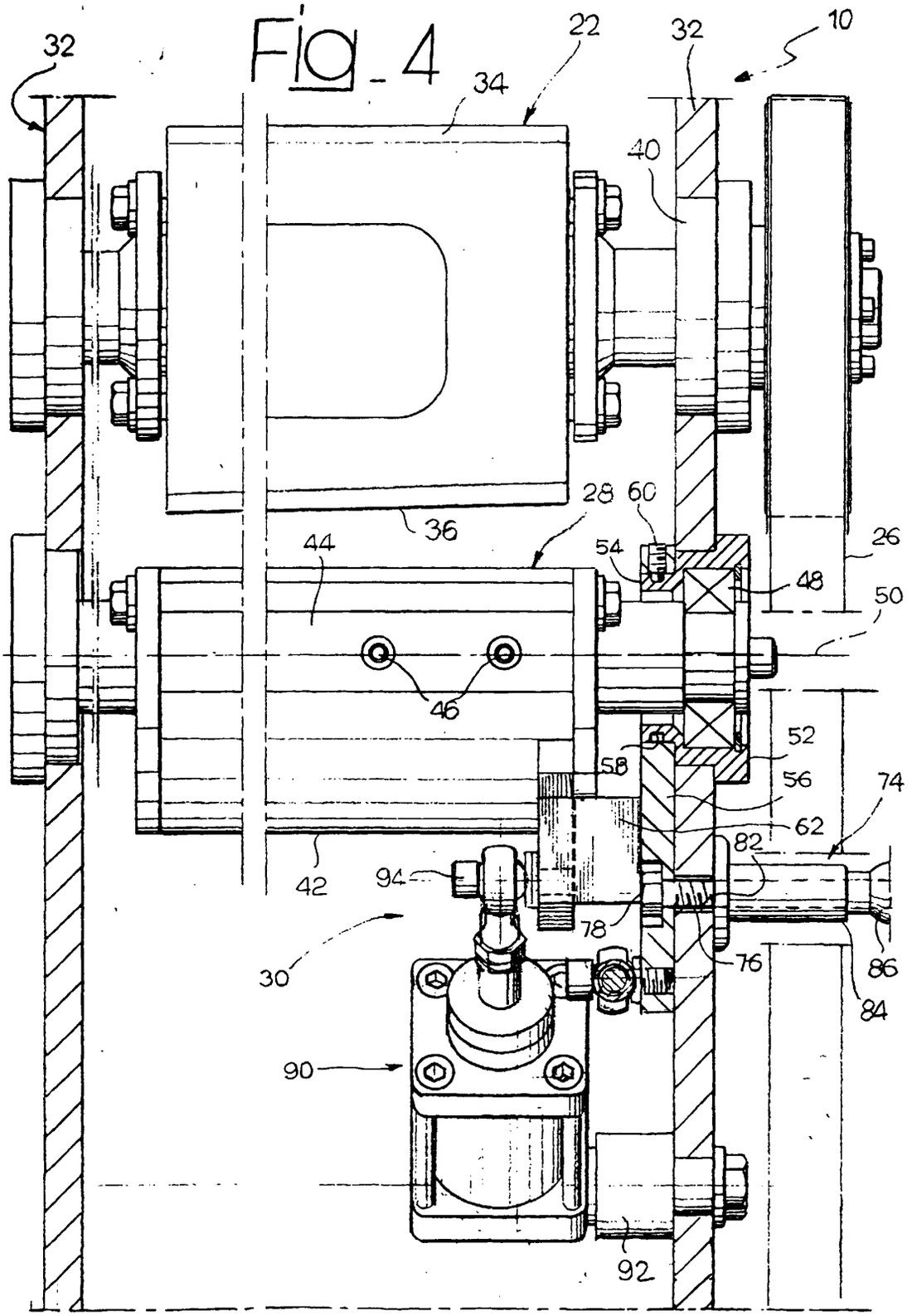
Fig_3

Fig. 4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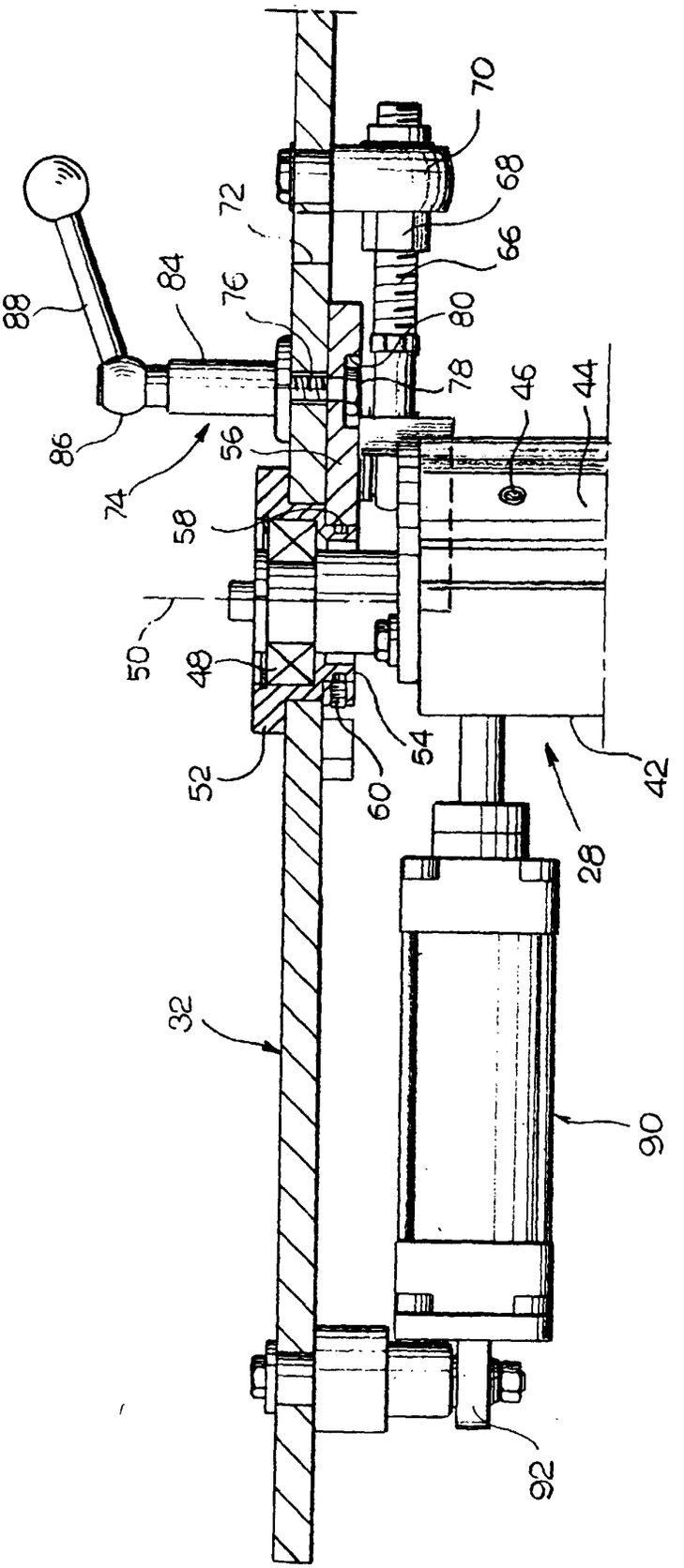
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Fig. 5

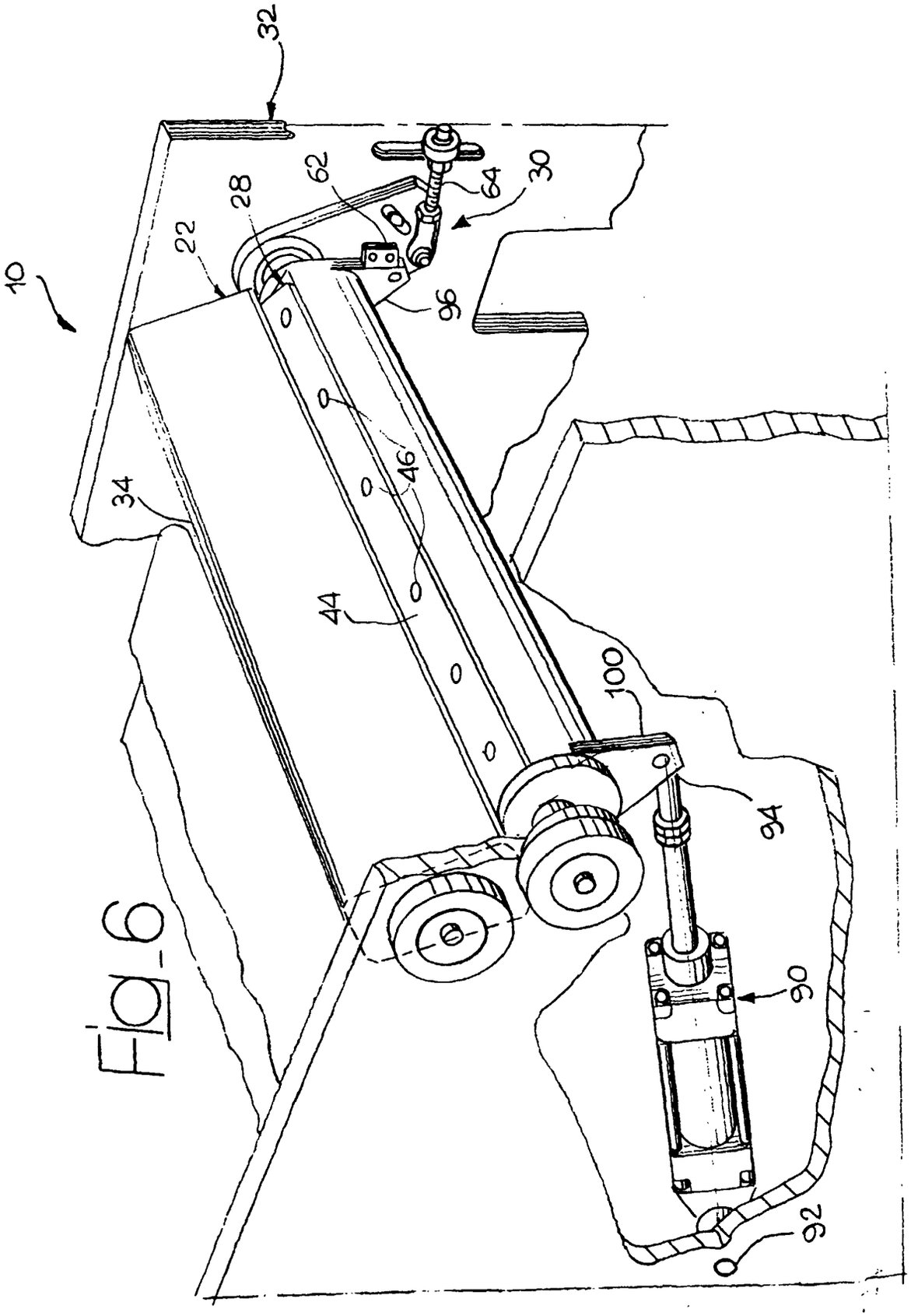

Fig_6

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EUROPEAN SEARCH REPORT

Application Number
EP 99 83 0271

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)
X	US 3 359 843 A (G. A. MEAD) 26 December 1967 (1967-12-26) * column 5, line 3 - line 65; figures 9-12 * ---	1,2	B65H35/08 B26D1/38 B26D7/26
A	US 2 782 853 A (R. D. HEFFELFINGER) 26 February 1957 (1957-02-26) * column 2, line 34 - column 3, line 49; figures 1-3 * -----	1-3	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

B65H
B26D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	4 November 1999	Raven, P

CATEGORY OF CITED DOCUMENTS

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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
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04-11-1999

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3359843 A	26-12-1967	NONE	
US 2782853 A	26-02-1957	NONE	

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82