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**Packaging machine with a stripping device**

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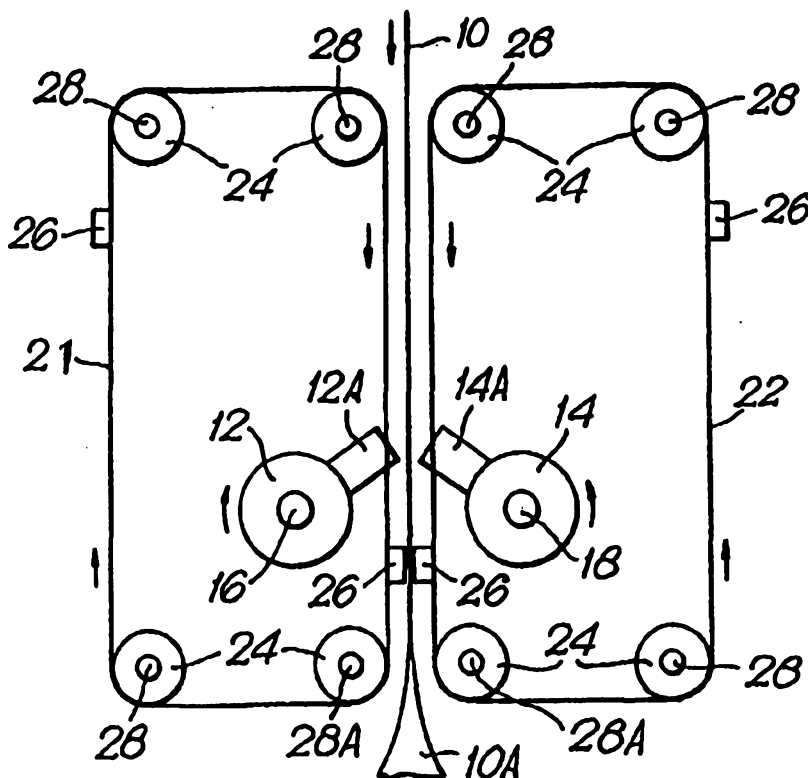
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<p>(21) International Application Number: PCT/GB96/00770                  (22) International Filing Date: 29 March 1996 (29.03.96)                  (30) Priority Data:                  9506876.3 1 April 1995 (01.04.95) GB                  9605426.7 15 March 1996 (15.03.96) GB                  (71) Applicant (for all designated States except US): MOLINS PLC [GB/GB]; 11 Tanners Drive, Blakelands, Milton Keynes MK14 5LU (GB).                  (72) Inventors; and                  (75) Inventors/Applicants (for US only): DAVISON, Clive [GB/GB]; 101 Lilac Grove, Beeston, Nottingham NG9 1PF (GB). KERRY, Malcolm, Charles [GB/GB]; 101 Lilac Grove, Beeston, Nottingham NG9 1PF (GB). SEAWARD, David, Robert [GB/GB]; University of Warwick Science Park, 2 Sir William Lyons Road, Coventry CV4 7EZ (GB).                  (74) Agent: HIRSH, Ivan, Yehudi; Molins plc, Group Patent Dept., Haw Lane, Saunderton, High Wycombe, Bucks. HP14 4JE (GB).</p>		<p>(81) Designated States: AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p><b>Published</b>                  With international search report.                  Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</p>

(54) Title: PACKAGING MACHINE WITH A STRIPPING DEVICE

(57) Abstract

A vertical form fill and seal packaging machine comprises a pair of sealing jaws (12, 14; 114, 116) for forming horizontal seals across the tubular packaging material (10) at regular intervals, and a stripping device comprising a pair of conveyors (21; 22; 42; 44; 51 etc.) mounted separately from and at the side of the sealing jaws and carrying cooperating parallel stripping bars (26; 40A, 40B, 40C, 40D) which are moved downwards by the conveyors, on opposite sides of the packaging material and ahead of engagement of the packaging material by the sealing jaws, to ensure that product being packaged drops down past the sealing jaws before the jaws act to form each seal.



1        Packaging Machine

2  
3                This invention is concerned with packaging machines of the type  
4 commonly referred to as vertical form fill and seal machines. In such  
5 machines, a web of packaging material is drawn along a former and then  
6 passes downwards in a tubular formation; the edges are then sealed  
7 longitudinally, after which horizontal seals are made at regular intervals  
8 to form individual packets. A measured quantity of product to be  
9 packaged is dropped into each packet before a top seal is formed by  
10 sealing jaws which simultaneously form the bottom seal of the next  
11 packet. The sealing jaws commonly include a cutting device which  
12 separates successive packets.

13                With some materials and in some circumstances, it is desirable to  
14 provide a stripping device to ensure that each measured quantity of the  
15 product passes downwards reliably into its packet before the top seal is  
16 formed. An example of a stripping device is described in European  
17 patent No. 165819. In that case cooperating stripping members are  
18 mounted on rotary sealing jaws and thus rotate at the same speed as the  
19 jaws. The present invention, on the other hand, allows stripping  
20 members to be driven at a greater speed than the sealing jaws while  
21 they are performing each stripping operation.

22                According to one aspect of the present invention, a packaging  
23 machine of the type described comprises a pair of sealing jaws for  
24 forming horizontal seals across the tubular packaging material at regular  
25 intervals, and a stripping device comprising a pair of conveyors mounted  
26 separately from and at the side of the sealing jaws (preferably at both  
27 sides) and carrying cooperating parallel stripping bars which are moved  
28 downwards by the conveyors, on opposite sides of the packaging  
29 material and ahead of engagement of the packaging material by the  
30 sealing jaws, to ensure that product being packaged drops down past  
31 the sealing jaws before the jaws act to form each seal. The reference to  
32 "the side of the sealing jaws" preferably applies to the position of the  
33 conveyor when viewed horizontally in a direction normal to the sealing  
34 surfaces of the jaws as they engage the packaging material.

35                In some packaging machines of this type it is also desirable to  
36 provide means to ensure that pieces of the product being packed do not  
37 fall into the seal area before the seal is formed. For that purpose the  
38 present invention may be adapted to provide, in addition to the stripping



1 bar, one or more pairs of product catching bars mounted on a pair of  
 2 conveyors as described above. The product catching bars are brought  
 3 close together by the conveyors carrying them, on opposite sides of the  
 4 packaging material and in a region above the sealing jaws as they form  
 5 each seal, to ensure that each quantity of product does not enter the  
 6 bottom seal area before the seal is formed. The product catching bars  
 7 may be carried by the same conveyors that carry the stripping bars, or  
 8 by separate conveyors.

9 The term "bar" as used in this context embraces rollers which can  
 10 rotate about their axes, as well as bars which are non-rotatably mounted  
 11 on the corresponding conveyor or conveyors.

12 Catching or clamping bars carried by endless conveyors are  
 13 disclosed in FR-A-2182006. The bars in that case have the purpose of  
 14 preventing the weight of liquid (which is the product being packaged)  
 15 bearing on each seal before it is securely formed.

16 This invention is particularly applicable to continuously moving  
 17 packaging material and sealing jaws, the jaws being for example in a  
 18 rotary form. However, it is in principle also applicable to machines  
 19 based on horizontally reciprocating sealing jaws, the drive for the  
 20 packaging material in this case being normally intermittent. In the case  
 21 of continuous rotary-type sealing jaws, the path of the jaws may be such  
 22 that the jaws remain in contact with the packaging material through a  
 23 finite distance. Alternatively, in the simplest type of rotary arrangement  
 24 the packaging material is only briefly engaged by the jaws while they are  
 25 at about their 3 o'clock and 9 o'clock positions respectively; for the  
 26 purpose of illustration, Figure 1 and 2 of the attached drawings show a  
 27 simple rotary sealing jaw arrangement in that form.

28 Each conveyor preferably comprises two belts or chains located  
 29 on opposite sides of the sealing jaws and carrying stripping bars  
 30 secured at their ends to the respective belts or chains.

31 According to another aspect of this invention, a vertical form fill  
 32 and seal packaging machine comprises means for feeding  
 33 tubular-formed packaging material between two rotary sealing members  
 34 which cooperate to form horizontal seals at intervals along the packaging  
 35 material between successive downward deliveries into the top opening  
 36 of the packaging material of quantities of product to be packaged,  
 37 characterised by a product control arrangement comprising a pair of  
 38 cooperating parallel bars each of which is supported at least at one end



1 by a carrier member mounted and driven separately from the sealing  
2 members and arranged to move the bar along a path extending  
3 downwards between the sealing members and upwards on the outside  
4 of the adjacent sealing member.

5 Examples of packaging machines according to this invention are  
6 shown diagrammatically in the accompanying drawings. In these  
7 drawings:

8 Figure 1 is a front view of part of one machine;

9 Figure 2 is a plan, on a larger scale, of part of the machine;

10 Figure 3 is a front view of a different machine;

11 Figure 4 is a partly sectioned plan view of the machine shown in  
12 Figure 3, partly broken for the sake of illustration; and

13 Figure 5 is an enlarged section of the right-hand portion of the  
14 machine as viewed in Figure 4.

15 Figure 1 shows packaging material 10 moving downwards  
16 between rotary sealing members 12 and 14 which include heated  
17 sealing jaws 12A and 14A. At this stage the packaging material has had  
18 its longitudinal (vertical) edges sealed together, and the portion below  
19 the sealing jaws already contains product being packaged; accordingly,  
20 the lower portion 10A of the packaging material shown in Figure 1 is in  
21 an expanded condition. The portion of the packaging material above the  
22 sealing jaws is shown flat (i.e. unexpanded) for the sake of simple  
23 illustration, but would in practice be in an expanded condition to provide  
24 space into which the next quantity of product will be dropped  
25 immediately after the sealing jaws have come together to form the next  
26 horizontal seal.

27 Each of the sealing members 12,14 is mounted on a shaft 16,18  
28 and the opposite ends of the shafts are mounted in bearings 20. A drive  
29 (not shown) is connected to the right-hand end of each shaft to rotate  
30 the shafts at identical speeds so that the sealing jaws 12A,14A come  
31 together to form seals across the packaging material at regular intervals.

32 A stripping device for the packaging machine comprises two pairs  
33 of belts 21,22 which pass around pulleys 24 and are located on opposite  
34 sides of the sealing jaws, as viewed in Figure 2. Each pair of belts  
35 carries a number of stripping bars 26 of which the ends are secured to  
36 the respective belts.

37 The pulleys 24 are all mounted in cantilever fashion on shafts 28,  
38 one of the shafts 28A for each pulley being connected to a drive (not



1 shown) whereby the belts are driven at the same speed (which fluctuates  
2 cyclically) and with appropriate timing with respect to the sealing jaws.

3 Figure 1 shows the sealing jaws 12A,14A at positions at which  
4 they are about to engage the packaging material 10. Two of the  
5 stripping bars are shown in positions just below the sealing jaws, having  
6 moved downwards along parallel vertical paths in contact with the  
7 packaging material and just ahead of the sealing jaws to ensure that the  
8 product being packaged has dropped down below the corresponding  
9 sealing position. For this purpose, the stripping bars 26 are moved by  
10 the belts 22 at a speed slightly greater than that of the packaging  
11 material 10 at least during the downward-moving part of their cycle, and  
12 may then be driven more slowly during the remainder of their cycle.

13 A common drive motor may be provided for the sealing jaws and  
14 belts. Preferably, however, separate speed-controllable "servo" drive  
15 motors may be provided, with provision for electronic timing, these being  
16 commercially available systems; each motor in this case may be capable  
17 of modulating its speed so that the sealing intervals can be adjusted  
18 while ensuring that the sealing jaws have a peripheral speed equal to  
19 that of the packaging material while they are engaging the packaging  
20 material to form each seal, and that the cooperating stripping bars on  
21 opposite sides of the packaging material have engaged the packaging  
22 material and performed their stripping operation before the material is  
23 engaged by the sealing jaws.

24 Instead of the belts 22 each having four pulleys with their axes at  
25 the four corners of a rectangle, various different arrangements are  
26 possible. For example, the pulleys may be arranged to form a path for  
27 each belt which converges obliquely and linearly towards the packaging  
28 material before passing around a pulley from which the belts move  
29 vertically downwards.

30 As mentioned above, the belts 21,22 may also carry product  
31 catching bars. Alternatively, product catching bars similar to the  
32 stripping bars 26 may be carried by separate pairs of belts running  
33 adjacent to the belts 21,22 (at least while moving downwards) and driven  
34 by a separate servo motor so that the speeds of these separate belts can  
35 be suitably modulated to enable the product catching bars to perform  
36 their desired operations.

37 With regard to the machine shown in Figures 3 to 5, Figure 3  
38 shows two pairs of stripping bars 40A-D in parked positions in which



1 they can be left if stripping is not required. Figure 3 (which omits certain  
2 parts for the sake of clear illustration) also shows one opposed pair of  
3 stripping bars in positions 40S and 40T in which they are about to  
4 commence their downward movement to cooperate with another in  
5 performing a stripping operation as described above with reference to  
6 the first example.

7 Each of the stripping bars is mounted at its opposite ends on two  
8 chains, for example chains 42 and 44 for the stripping bar 40A shown in  
9 Figures 4 and 5. Each chain passes around four sprockets mounted for  
10 rotation about horizontal axes at the four corners of a rectangle. Two  
11 upper sprockets 45 and 46 for the chain 42 are shown, as well as two  
12 upper sprockets 48 and 50 for the chain 44. The corresponding  
13 opposed stripping bar (not shown) is similarly carried by chains of which  
14 only one chain 51 is shown passing around sprockets 56,58 in Figure 4.  
15 Sprockets 102,104 for the other chain are shown in Figure 4 and 5.

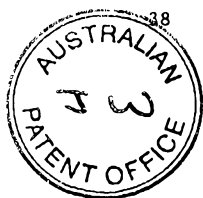
16 Immediately behind the stripping bar 40A as it moves towards the  
17 centre line of the machine (i.e. upwards as viewed in Figure 4) is a  
18 product catching roll 60. This is mounted at its opposite ends on chains  
19 62 and 64 which run parallel to the chains 42 and 44. The chains 62 and  
20 64 run respectively around four sprockets coaxial with the sprockets for  
21 the chains carrying the stripper bars. Sprockets 66 and 68 for the chain  
22 62 are shown more clearly in Figure 5, which also shows upper  
23 sprockets 70 and 72 for a corresponding chain 74 supporting one end of  
24 an opposed catching roll 76 (see Figure 3).

25 The chain 64 (Figure 4) with its corresponding sprockets forms  
26 essentially a mirror image of the arrangement shown in Figure 5.

27 Figure 3 shows the approaching stripping bars 40A,40B which will  
28 come together and cooperate at the position shown in dotted outlines  
29 40S and 40T to commence the stripping action as described above.  
30 Figure 3 also shows the additional stripping bars 40C,40D which are at  
31 that stage moving apart, followed by product catching rolls 78 and 80  
32 carried by the outer pairs of chains 62,64 etc.

33 As they move downwards the chains are backed and supported  
34 by guide members 79 and 81.

35 The sprockets are mounted on several shafts of which two shafts  
36 80A and 80B are shown (Figure 4) extending from one side of the  
37 machine to the other and are mounted for rotation in bearings in side  
38 frame members 82 and 84. Additional short shafts are provided for other



1 sprockets, for example, shafts 80C and 80D as shown in Figure 5.

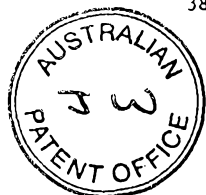
2 The chains carrying the product catching rolls are driven by a  
3 timing belt 86 passing around a pulley 88 mounted on the shaft 80B. the  
4 sprocket 72 for the chain 74 is keyed to the shaft 80B so that this chain  
5 in turn drives the shaft 80D via the sprocket 70 which is keyed thereto.  
6 This shaft is in turn connected to the shaft 80C via gears 90 and 92 and  
7 thus drives the shaft 80C (to which the sprocket 68 is keyed) and  
8 consequently also the shaft 80A to which the sprocket 66 is keyed. The  
9 shafts 80A and 80B in turn drive sprockets for the other chains 64 etc  
10 which support the product catching rolls on the other side of the  
11 machine.

12 The inner chains 42,44 etc carrying the stripping bars are driven  
13 by a timing belt 94 (Figure 3) via a pulley 96 keyed to a shaft 98. As in  
14 the case of the outer chains for the product catching rolls, the shaft 98  
15 driving the adjacent sprocket (not visible in the drawings) for a stripping  
16 bar chain also drives the corresponding sprocket and chain on the other  
17 side of the machine, and the other sprockets for the stripping bar chains  
18 are driven by various gears and an additional cross shaft (not shown) in  
19 essentially the same manner as is described above with respect to the  
20 chains and sprockets for the catching rolls.

21 With reference to Figure 5, it will be appreciated that, while the  
22 sprocket 72 for the chain 74 is keyed to the shaft 80B, the sprocket 102  
23 for the stripping bar chain 51 is instead mounted on the shaft 80B via a  
24 bearing. Similarly, each other sprocket in the machine is either keyed to  
25 the shaft carrying it or is mounted on a bearing as necessary to enable  
26 all the stripping bar and catching roll chains to be driven by  
27 independent motors driving respectively the belts 94 and 86.

28 Instead of two pairs of stripping and catching bars, there may be  
29 three or more.

30 Independent drives are provided partly so that the spacing  
31 between each stripping bar and its following catching roll can be varied  
32 during downward movement. Thus the catching rolls can initially lag  
33 behind the stripping bars to create a gap sufficient for the sealing jaws to  
34 pass between them, as necessary, the catching rolls being subsequently  
35 driven at a greater speed to reduce the gaps only after the cooperating  
36 sealing jaws on the sealing members (described below) have passed  
37 beyond the 9 o'clock/3 o'clock positions sufficiently to enable the  
38 catching rolls to pass through the gap between the sealing jaws.





1 Moreover, separate electronically timed drives are provided for the  
2 chains and also for the sealing members to enable the distances  
3 between the successive horizontal seals on the packaging material to be  
4 varied in accordance with the desired lengths of the packets to be  
5 formed. The electronic drives also enable the stripping distance for each  
6 bag to be adjusted: that is to say, the distance along which the stripping  
7 bars move forwards with respect to and in close proximity to the  
8 packaging material to perform each stripping operation.

9 In order to ensure that, following stoppage of the machine, the  
10 various drives are appropriately timed with respect to one another before  
11 the feed of packaging material is re-started, shaft position encoders or  
12 independent sensor may be included to signal the positions of the  
13 various drives and thus enable their electronic controls to achieve the  
14 desired timing between the drives. This facility may include "cam"  
15 switches driven by the drives so as to make one revolution for each  
16 packet, with detectors for determining if the machine stops with any drive  
17 in a position (indicated by the corresponding "cam") in a position  
18 indicating a potential clash between two or more components of the  
19 machine (sealers, strippers and catchers). In that case the drives can be  
20 initially driven by the electronic controller so as to be appropriately  
21 positioned relative to one another before the machine is brought fully  
22 into operation. During this start-up procedure the precise positions of  
23 the drives can be signalled to the electronic controller by detectors  
24 sensing the leading or trailing edge of each "cam" as it moves past the  
25 respective detector.

26 Figure 4 shows two shafts 110 and 112 which carry respective  
27 rotary sealing members 114 and 116 and are mounted at their opposite  
28 ends for rotation in bearings in the side frames 82 and 84. Each of the  
29 sealing members has opposed (180° spaced) sealing jaws of which jaws  
30 114A and 116B are shown in positions in which they are cooperating to  
31 form a seal in the packaging material (not shown). Thus the sealing  
32 members form two seals during each revolution. The sealing member  
33 114 is driven by a trimming belt 117, and the sealing member 116 is  
34 driven in the opposite direction and at the same speed via gears 117A  
35 and 117B.

36 Figure 3 shows one end bearing 118 for the shaft 110, and an end  
37 bearing 120 for the shaft 112. A spring 122 (or set of springs) is  
38 provided to load the shaft 112 towards the shaft 110 so that an



1 adjustable contact force between the sealing members is achieved  
2 during each sealing operation. The spring force is adjustable by means  
3 of a bolt 124.

4 Each of the sealing bars is electrically heated. Electrical power is  
5 applied to them for that purpose via fixed members 126 and 128  
6 engaging slip rings (not shown) on the shafts.

7 Figure 3 shows a chain tensioning member 130 which carries  
8 adjacent pairs of lower sprockets and is movable downwards to tension  
9 all four chains on one side of the machine. With this arrangement it will  
10 be understood that a similar arrangement would be provided for  
11 tensioning the chains on the other side of the machine. However, other  
12 ways of the tensioning the chains may alternatively be used to allow  
13 greater independence in the tensioning of each chain.

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1        Claims:  
2

3            1.        A vertical form fill and seal packaging machine comprising  
4        a pair of sealing jaws (12,14; 114,116) for forming horizontal seals across  
5        the tubular packaging material (10) at regular intervals, and a stripping  
6        device comprising a pair of conveyors (21; 22; 42; 44; 51 etc.) mounted  
7        separately from and at the side of the sealing jaws and carrying  
8        cooperating parallel stripping bars (26; 40A,40B,40C,40D) which are  
9        moved downwards by the conveyors, on opposite sides of the  
10       packaging material and ahead of engagement of the packaging material  
11       by the sealing jaws, to ensure that product being packaged drops down  
12       past the sealing jaws before the jaws act to form each seal.  
13

14            2.        A packaging machine according to claim 1, in which there  
15        are two conveyors (21,22; 42,44 etc.) for each stripping bar (26;  
16        40A,40B,40C,40D) supporting opposite ends of the bar.  
17

18            3.        A packaging machine according to claim 2, in which the  
19        endless conveyors are belts, chains or equivalent endless flexible  
20        devices which move along closed paths around support members (22;  
21        44,46,48,50; 66,68 etc.).  
22

23            4.        A packaging machine according to claim 3, in which the  
24        conveyors comprise chains (42,44 etc.).  
25

26            5.        A packaging machine according to claim 3 or claim 4, in  
27        which each conveyor carries two or more stripping bars.  
28

29            6.        A packaging machine according to any one of claims 3 to  
30        5, in which the sealing jaws (12,14; 114,116) are mounted for rotation  
31        about horizontal axes, and in which the path of each conveyor extends  
32        around the axis of one of the sealing jaws.  
33

34            7.        A packaging machine according to any one of the claims 3  
35        to 6, in which each support member is fixed to or rotatable around a  
36        shaft (80A-D etc.) which also carries a second support member for a  
37        further endless flexible conveyor (62; 74 etc.) carrying a catching bar  
38        (60; 76,78,80) arranged to cooperate with another catching bar on the



1 other side of the packaging material to prevent product dropping  
2 prematurely into the area of the seal.

3  
4 8. A packaging machine according to claim 7, in which the  
5 stripping bars, catching bars and sealing jaws are driven respectively by  
6 three independent motors which are electronically controlled with  
7 respect to one another.

8  
9 9. A packaging machine according to claim 8, in which the  
10 controls for the motors driving the stripping and catching bars are such  
11 as to enable the stripping and catching bars to be parked in positions  
12 away from the packaging material when stripping and catching are not  
13 required.

14  
15 10. A vertical form fill and seal packaging machine comprising  
16 means for feeding tubular-formed packaging material between two rotary  
17 sealing members which cooperate to form horizontal seals at intervals  
18 along the packaging material between successive downward deliveries  
19 into the top opening of the packaging material of quantities of product to  
20 be packaged, characterised by a product control arrangement  
21 comprising a pair of cooperating parallel bars (26; 40A,40B; 40C,40D)  
22 each of which is supported at least at one end by a carrier member (21;  
23 22; 42; 51; 62 etc.) mounted and driven separately from the sealing  
24 members (12,14; 114,116) and arranged to move the bar along a path  
25 extending downwards between the sealing members and upwards on  
26 the outside of the adjacent sealing member.

27  
28 11. A packaging machine according to claim 10, which each  
29 product control bar (26,40A,40B,40C,40D) is carried at both ends by  
30 carrier members (21,22; 42,44 etc.) comprising endless flexible  
31 conveyors which move along closed paths around rotary support  
32 members (24; 44,46; 48,50; 66,68 etc.).

33  
34 12. A packaging machine according to claim 10 in which the  
35 endless flexible conveyors comprise chains (42,44 etc.).

36  
37 13. A packaging machine according to claim 10 or claim 11, in  
38 which there are two types of product control bars which are mounted on



1 separate endless flexible conveyors, namely product stripping bars (40A,  
2 40B, 40C, 40D) which are driven so as to cooperate with the packaging  
3 material in advance of the sealing members (114, 116), and catching  
4 bars (60, 76, 78, 80) which follow the sealing members to prevent  
5 product dropping prematurely into the seal area before sealing has been  
6 accomplished.

7  
8 14. A packaging machine according to any one of the claims  
9 10 to 13, in which each of the rotary sealing members (12, 14; 114, 116)  
10 is mounted on a shaft (16, 18; 110, 112) supported at both ends in  
11 bearings in a support frame (82, 84), and the path of each carrier  
12 member extends around the corresponding shaft near one end thereof.

13  
14 15. A vertical form fill and seal packaging machine arranged to  
15 feed a tubular packaging material along a downwardly extending path  
16 and comprising a pair of sealing jaws arranged on opposite sides of said  
17 path for forming horizontal seals across the tubular packaging material  
18 at regular intervals and a product control device comprising a conveyor  
19 arrangement on each said side of the path which conveyor  
20 arrangements are mounted separately from and laterally of the sealing  
21 jaws and carry respective parallel stripping bars which are moved along  
22 continuous paths by said conveyor arrangements such that the stripping  
23 bars cooperatively sweep downwardly past and on opposite sides of the  
24 packaging material prior to engagement of the packaging material by the  
25 sealing jaws to form a seal so as to ensure that product being packaged  
26 drops down past the sealing jaws before the jaws act to form the seal,  
27 the arrangement being such that said stripping bars have respective  
28 parked positions in which they can be parked so as to permit operation  
29 of the machine without stripping.

30  
31 16. A vertical packaging machine substantially as hereinbefore  
32 described with reference to the accompanying drawings.

33  
34 Dated this 8th day of September, 1999.

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36 By its Patent Attorneys

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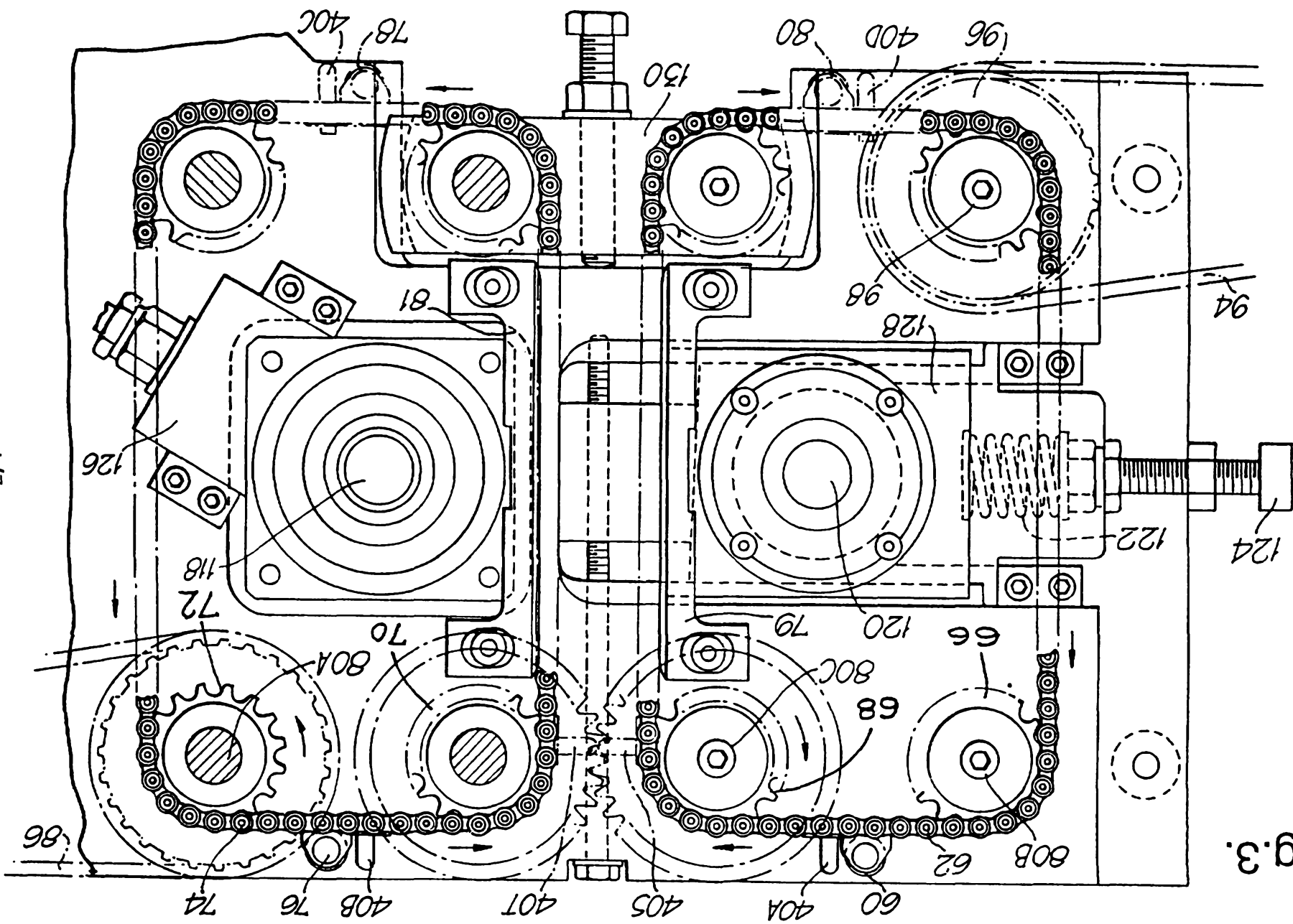


Fig. 3.

Fig. 4.

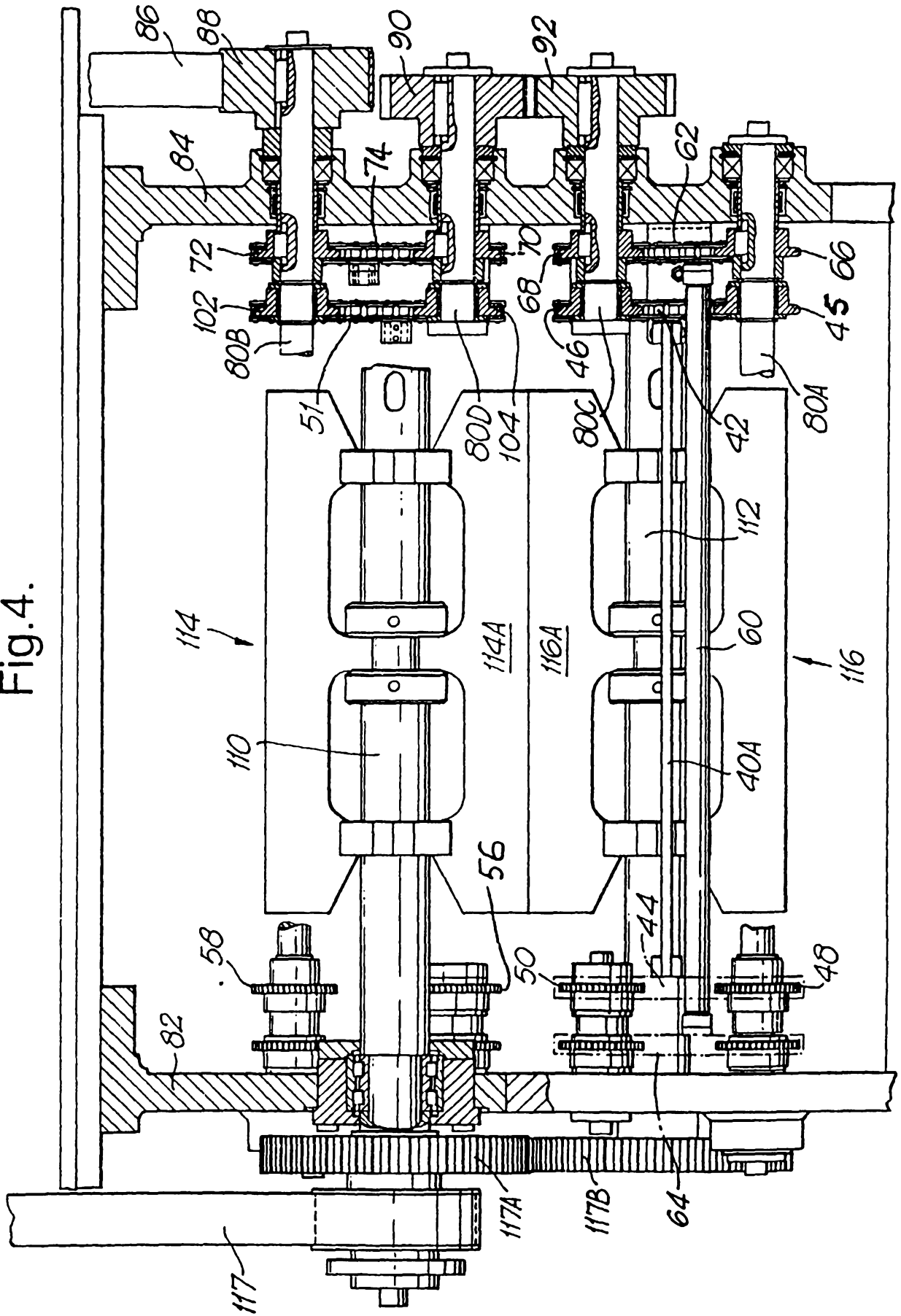




Fig.5.

