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(54) **Carton panel folding mechanism.**

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Description

This invention relates to a folding mechanism for folding certain panels of a carton blank during a packaging operation. The invention is particularly concerned with the folding of reinforcing panels provided in the upper parts of a wraparound type carton in which such reinforcing panels are folded into and secured in overlapping relationship with adjacent areas of the carton blank to strengthen the carton.

Wraparound cartons which comprise a sleeve of paperboard wrapped and secured about a group of articles such as bottles are well known. During the packaging operation the carton may become wetted by moisture formed as condensation on the bottles to be packaged which ultimately can weaken the paperboard material or cause it to stretch thereby producing an unsatisfactory package. Reinforcing panels provided at appropriate locations on a carton blank to be folded to form a double ply thickness of material can be provided to minimise this problem and/or also allow the use of smaller caliper paperboard material for producing such carton.

The present invention relates to a mechanism for folding reinforcing panels of a wraparound carton blank into superposed relationship with other parts of the blank adjacent thereto as the blank is advanced along a feed path, said mechanism comprising a plurality of folder elements each of which move in an endless path, a part of which path has a working reach adjacent said blank feed path in which the folder elements and the blank are moved together during the folding process, each of said folder elements including pivotal arms to engage and fold the reinforcing panels by executing a pivotal movement, and cam means provided to effect pivoting of the pivotal arms of a plurality of leading folder elements predominantly in opposition to the direction of feed of the blank and in that further common cam means is provided to effect pivoting of the pivotal arms of a plurality of of trailing folder elements predominantly in the direction of feed of the blank. such a mechanism is known from US.A 351621g. The present invention provides a mechanism as defind in claim 1

A mechanism embodying the invention will now be described by way of example, with reference to the accompanying drawings, in which:-

FIGURES 1 and 1a are plan views of portions of a carton blank which is compatible with a mechanism according to the invention, as seen from the underside;

FIGURES 2, 3 and 4 are similar plan views of a part of the mechanism showing the mounting arrangement of the folder elements;

FIGURE 5 is a side view of a part of the mechanism showing a pivotal arm of one of the folder elements;

FIGURE 6 is a cross-sectional view through a part of the mechanism along the line X-X in Figure 5, showing mounting and constructional detail of one of the folder elements;

FIGURE 7 is a schematic side view of the mechanism showing a side plate assembly; and

FIGURE 8 is a schematic side view of the mechanism as seen at the centre cam plate and showing one of the folder elements in a number of sequential positions.

Referring first to Figures 1 and 1a of the drawings, a carton blank of the wrap-around type (only a portion 10 of which is shown) comprises a top panel 12 to opposite side edges of which are hinged side wall panels 14 and 16 along fold lines 18 and 20 respectively. The carton blank is specifically adapted to be wrapped about a group of bottles arranged in two parallel rows of five bottles each. Apertures 'A' are formed at spaced locations along fold lines 18 and 20 to receive top portions of the bottle necks and their closures.

In order to reinforce portions of the carton, foldable reinforcing panels P1, P2, P3 and P4 are provided and which extend across the blank so that portions of the top panel and adjacent portions of the side wall panels can be strengthened. Panels P1 and P4 are provided at opposite side edges of the blank and panels P2 and P3 are provided intermediate the end edges to strengthen a central handle panel H which is flanked on either side by hand gripping apertures G1 and G2. The mechanism described below is adapted to fold the reinforcing panels P1-P4 into superposed relationship with adjacent areas of the blank as shown in stippling in Figures 1a while the blank is conveyed through a packaging machine and the reinforcing panel may be glued to those areas. Referring specifically to Figure 1a, if it is assumed that the carton blank is moved along a feed path in a packaging machine from left to right then the leading edge panel P1 and the leading handle panel P2 are both folded from right to left i.e. against the direction of feed whereas the trailing edge panel P4 and the trailing handle panel P3 are both folded from left to right i.e. with the direction of feed.

Referring to Figure 7, a panel folding mechanism 30 is mounted at the infeed end of a packaging machine only a part 32 of the machine being shown. Carton blanks are fed one after the other by suitable feed means in a forwardly and downwardly directed feed path 'F' and each blank is supported immediately below the lower face 30a of the mechanism above the tops of bottles to be wrapped by a known paperfeed conveyor (not shown). The paperfeed conveyor generally comprises an endless chain having a series of spaced

upstanding lugs which push the blank along the machine feed path by engagement with the trailing edge of the blank.

The mechanism comprises a number of folder elements e.g. element 'E' which are mounted in tandem on a series of endless chains 'C' as will now be described in greater detail with reference to figures 2 to 6.

Mechanism 30 comprises a pair of similar parallel flank plates 34, 36 spaced apart so as to accommodate between them a bank of six parallel endless chains 'C' mounted in two sets 38, 40, 42 and 44, 46, 48 of three chains each on either side of a central cam plate 50. At one end of the mechanism, the chain sets are entrained about upper coaxial driven sprocket sets 52, 54, 56 and 58, 60, 62 respectively and lower idler sprocket sets indicated by axis 64 (Figure 7) and at the other end of the mechanism about intermediate idler sprocket sets indicated by axis 66 (Figure 7).

Folder elements E1-E4 extend transversely between the flank plates 34 and 36 each of the folder elements being of similar construction (Figures 2-4). With reference to Figure 6, folder element E1 is described in more detail. The folder element E1 comprises an elongate bar 68 which is located at each of its opposite ends by studs or rollers 70, 72 engaged in guide tracks 74, 76 formed in guide plates 78, 80 respectively. The guide plate 78, 80 are attached to the internal juxtaposed faces of the respective flank plates 34 and 36 of the mechanism.

The folder element E1 carries a pivotal body 82 in a central aperture 84 of the bar, the pivotal body being of generally H-shaped cross-section and being pivotable about a rod 86. The ends of the rod are received in recesses 88, 90 formed in the bar 68 at opposite ends of the central recess 84 and are retained by removable fasteners 92, 94 respectively. The pivotal body comprises a pair of like parallel guide arms 96, 98 extending in one direction from the aperture 84 and a pair of like parallel folder arms 100, 102 extending in the opposite direction from the aperture 84. One of the guide arms carries a cam follower 104 which is located in a cam track 106 formed in one face of the central cam plate 50. The opposite face of the cam plate 50 also is formed with a cam track 108 of different configuration to that of cam track 106 and in which a follower of another of the folder elements engages as described later. Folder body 82 is spring loaded within central aperture 84 by a helical spring 110 to ensure positive engagement between the follower and its associated cam track. The opposed folder arms 100, 102 of the folder body each carry a folder head 112, 114 respectively which engage a reinforcing panel P of the carton blank during the folding process to be described. The other folder elements are of like construction.

Folder element E1 is connected to chain 38 at one of its ends and also connected to chain 44 intermediate its ends by connecting numbers 116, 118 respectively. These connections are illustrated diagramatically in Figures 2, 3 and 4 by references a, b respectively. Folder elements E2 and E3 are both connected intermediate their ends to chains 40 and 46 as indicated by references c, d and e, f respectively. Folder element E4 is connected to chain 42 at one of its ends and also connected to chain 48 intermediate its ends as indicated by reference g, h respectively. These connections provide for relative adjustment of the folder elements as will be described later.

The folder elements are therefore conveyed in endless path by the respective chain and sprocket sets so that each folder element moves through a working reach in which the folder heads of the folder element execute a panel folding action in the feed path 'F' and moves through a return path R (Figures 7 and 8) remote from the feed path.

The guide plates 78, 80 which include the guide tracks 74, 76 and the central cam plate 50 having opposed cam tracks 106, 108 are provided at the lower end of the mechanism so that the folding elements cooperate with these components of the mechanism only during their movement through the working reach.

Referring to Figure 8, one of the folder elements is shown at a number of successive positions about its path of travel and it will be seen by arrows a^1 and a^2 that the folder heads of the folder element execute a forward and upward pivotal action in relation to the carton blank feed path F. Thus, the folder heads of the element illustrated pivot with the direction of flow and therefore show the action of folder element E4 or E3 which are responsible for folding the trailing edge panel P4 and the trailing handle panel P3 respectively of the carton blank. In order to achieve the necessary folding action, first the folder heads strike the reinforcing panel P3 or P4 to be folded at approximately folder element position f1 at which location the folder heads pivot the reinforcing panel downwardly out of the plane of the blank and forwardly in the feed direction 'F' of the blank while the folder element itself is moving in the feed direction through the working reach. Of course, the pivotal action is transmitted to the folder arms of the pivotal body by the cam follower which moves in a path dictated by the contour of the cam track 108. At position f2 the cam track 108 is formed with a trough or valley 108a which causes a forward and upward pivotal action of the associated reinforcing panel P3, P4 so that it is again returned substantially into the plane of the blank but this time into

superposed relationship with and secured to the undersurface of the blank i.e. as shown by the stippled areas in Figure 1. The cam track 108 is contoured so as to then retract the folder heads from contact with the blank by causing the folder arms to pivot downwardly and backwardly as shown by arrow a^3 i.e. against the feed direction 'F', to the positions shown at location 'f3' whereafter it then moves out of the working reach and into the return reach of the mechanism.

The folder elements E1 and E2 which are responsible for causing the folding of the leading edge reinforcing panel P1 and the leading handle reinforcing panel P2 respectively both have a guide arms whose cam follower is engaged with and constrained to follow the opposed cam track 106 in the central cam plate 50. As previously mentioned, reinforcing panels P1 and P2 are folded against the feed direction 'F' of the carton blank. This entails pivotal movement of the folder arms of elements E1 and E2 which is predominantly rearward, relative to the carton feed and upwardly and the contour of cam track 106 is therefore appropriately formed to produce such pivotal action.

Referring again to Figures 2, 3 and 4, Figure 2 shows leading and trailing edge panel folder elements E1 and E4 separated by distance 'X' and leading and trailing handle panel folder elements E2 and E3 separated by distance 'Y'. In order to allow other sized carton blanks to be compatible with the mechanism and the distance between leading folder element E1 and trailing folder element E4 is made adjustable as is the distance between folder element E1 and the handle panel folder element E2 and between the folder element E4 and handle panel folder element E2. The distance between the two adjacent handle panel folder elements is not made adjustable since this dimension 'Y' remains constant between the carton panels P2, P3. Figures 2 and 3 show distance Y = Y1 but distance X1 > X.

In order to provide for this relative adjustability, reference is now made specifically to Figure 4 which shows folder elements E1-E4 in random relative locations for illustration only and which do not correspond to relative spacings for a carton. As previously referred to, handle panel folder elements E2 and E3 are both fixed to the same chains i.e. chains 40 and 46 which are entrained about sprockets 54 and 58 respectively.

Further folder element E1 is fixed to chains 38 and 44 which are entrained about sprockets 52 and 58 respectively and folder element E4 is fixed to chains 42 and 48 which are entrained about sprockets 56 and 62 respectively. These sprocket pairs are made adjustable relative to one another by coaxial shaft assembly 'S' which incorporates a spring clutch 'T' to allow the sprocket pairs to rotate together as required in use or alternately to rotate relative to one another as required for adjustment in the distance between the folder elements.

Claims

1. A mechanism for folding reinforcing panels of a wraparound carton blank into superposed relationship with other parts of the blank adjacent thereto as the blank is advanced along a feed path(F), said mechanism comprising a plurality of folder elements(E1-E4) each of which moves in an endless path, a part of which path has a working reach adjacent said blank feed path in which the folder elements and the blank are moved together during the folding process, each of said folder elements including pivotal arms(100,102) to engage and fold the reinforcing panels(P1-P4) by executing a pivotal movement, and cam means (50) provided to effect pivoting of the pivotal arms of a plurality of leading folder elements(E1,E2) predominantly in opposition to the direction of feed of the blank and to effect pivoting of the pivotal arms of a plurality of trailing folder elements(E3,E4) predominantly in the direction of feed of the blank, characterised in that said cam means comprise a common cam plate(50)having one camtrack (106,108) in each of two opposed surfaces of the plate, the pivotal arms of the leading folder elements cooperating with one(106)of said cam tracks to effect pivotal movement thereof, and the pivotal arms of the trailing folder elements cooperating with the other(108)of said cam tracks to effect pivotal movement thereof.

2. A mechanism according to claim 1, further characterised in that each folder element is connected to and conveyed in said endless path by a plurality of endless chains(38-48).

3. A mechanism according to claim 1 or claim 2 further characterised in that one of the leading folder elements is adjustable along the endless path relative to a next succeeding leading folder element and one of the trailing folder elements is adjustable along the endless path relative to the immediately preceding trailing element.

4. A mechanism according to any of the preceding claims, further characterised in that a pair of leading folder elements and a pair of trailing folder elements is provided and in that said common cam means initiates sequentially piv-

otal movement of the pivotal arms of successive folder elements.

Revendications

1. Mécanisme de pliage des panneaux de renfort d'un flan de carton du type à enveloppement des produits à emballer par superposition avec d'autres panneaux adjacents du flan lorsque cellui-ci avance sur un chemin d'alimentation (F), ledit mécanisme comprenant plusieurs éléments plieurs (E1-E4) dont chacun se déplace sur une trajectoire sans fin, une partie de celle-ci ayant une course de travail adjacente à ladite trajectoire d'alimentation de flans, dans laquelle les éléments plieurs et le flan sont déplacés ensemble pendant le processus de pliage, chacun desdits éléments plieurs comprenant des bras pivotants (100, 102) pour engager et plier les panneaux de renfort (P1-P4) en réalisant un mouvement pivotant et un moyen à came (50), mécanisme caractérisé par le fait que le moyen à came comporte une plaque de came commune (50) ayant une piste de came (106, 108), dans chacune des deux surfaces opposées de la plaque, prévue pour assurer la rotation des bras de pivotement de plusieurs éléments plieurs avant (E1, E2), essentiellement en sens inverse au sens d'alimentation de l'ébauche, et pour réaliser la rotation des bras pivotants de plusieurs éléments plieurs arrière(E3, E4), essentiellement dans le sens d'alimentation de l'ébauche, les bras pivotants des éléments plieurs avant coopérant avecl'une (106) desdites pistes de came pour en effectuer le mouvement pivotant, et les bras pivotants des éléments plieurs arrière coopérant avec la seconde (108) desdites pistes de came pour en effectuer également le mouvement pivotant.

2. Mécanisme selon la revendication 1, caractérisé par le fait que chaque élément plieurs est relié à la trajectoire sans fin et acheminé dessus par plusieurs chaînes sans fin (38-48).

3. Mécanisme selon l'une quelconque des revendications 1 ou 2, caractérisé par le fait que l'un des éléments plieurs avant est réglable sur la trajectoire sans fin, relativement à l'élément plieur avant suivant, et l'un des éléments plieurs arrière est réglable sur la trajectoire sans fin, relativement à l'élément arrière immédiatement précédent.

4. Mécanisme selon l'une quelconque des revendications 1 à 3, caractérisé par le fait qu'il est prévu une paire d'éléments plieurs avant et une paire d'éléments plieurs arrière et par le fait que le moyen à came commun amorce un mouvement de rotation séquentiel des bras pivotants des éléments plieurs successifs.

Ansprüche

1. Mechanismus zum Falten von Verstärkungswänden eines Rundumhüllen-Kartonzuschnittes in einer übereinanderliegenden Beziehung mit anderen dazu benachbarten Teilen des Zuschnittes, während der Zuschnitt entlang eines Vorschubweges vorgeschoben wird, der eine Anzahl Faltelemente (El bis E4), die sich jeweils in einem Endlosweg bewegen, wobei ein Teil dieses Weges einen dem Zuschnittvorschubweg benachbarten Arbeitsbereich aufweist, in dem die Faltelemente und der Zuschnitt während des Faltprozesses zusammen verschoben werden, wobei jedes der Faltelemente Schwenkarme (100, 102) einschließt, um die Verstärkungswände (P1 bis P4) durch Vollziehen einer Schwenkbewegung zu ergreifen und zu falten und Mitnehmer umfaßt, die vorgesehen sind, ein Schwenken der Schwenkarme einer Anzahl von Vorlauffaltelementen (El, E2) vorwiegend entgegengesetzt der Vorschubrichtung des Zuschnittes zu veranlassen und ein Schwenken der Schwenkarme einer Anzahl von Nachlauffaltelementen (E3, E4) vorwiegend in Vorschubrichtung des Zuschnittes zu veranlassen, dadurch gekennzeichnet, daß die Mitnehmer eine gemeinsame Mitnehmerplatine (50) besitzen, die eine Mitnehmerbahn (106, 108) in jeder der beiden entgegengesetzten Seiten der Platine aufweisen, wobei die Schwenkarme der Vorlauffaltelemente mit einer (106) der Mitnehmerbahnen zusammenwirken, um deren Schwenkbewegung zu veranlassen, und die Schwenkarme der Nachlauffaltelemente mit der anderen (108) der Mitnehmerbahnen zusammenwirken, um deren Schwenkbewegung zu veranlassen.

2. Mechanismus nach Anspruch 1, dadurch gekennzeichnet, daß jedes Faltelement verbunden ist mit und transportiert wird in dem Endlosweg durch eine Anzahl von Endlosketten-bändern (38 bis 48).

3. Mechanismus nach Anspruch 1 oder Anspruch 2, dadurch gekennzeichnet, daß eines der Vorlauffaltelemente entlang des Endlosweges in Bezug auf ein nächstes nachfolgendes Vorlauffaltelement verstellbar ist und eines der Nachlauffaltelemente entlang des Endlosweges in

Bezug auf ein unmittelbar vorhergehendes Nachlaufelement verstellbar ist.

4. Mechanismus nach irgendeinem der vorangegangenen Ansprüche, dadurch gekennzeichnet, daß ein paar Vorlauffaltelemente und ein paar Nachlauffaltelemente vorgesehen sind und, daß der gemeinsame Mitnehmer regelmäßige Schwenkbewegung der Schwenkarme der aufeinander folgenden Faltelemente einleitet.

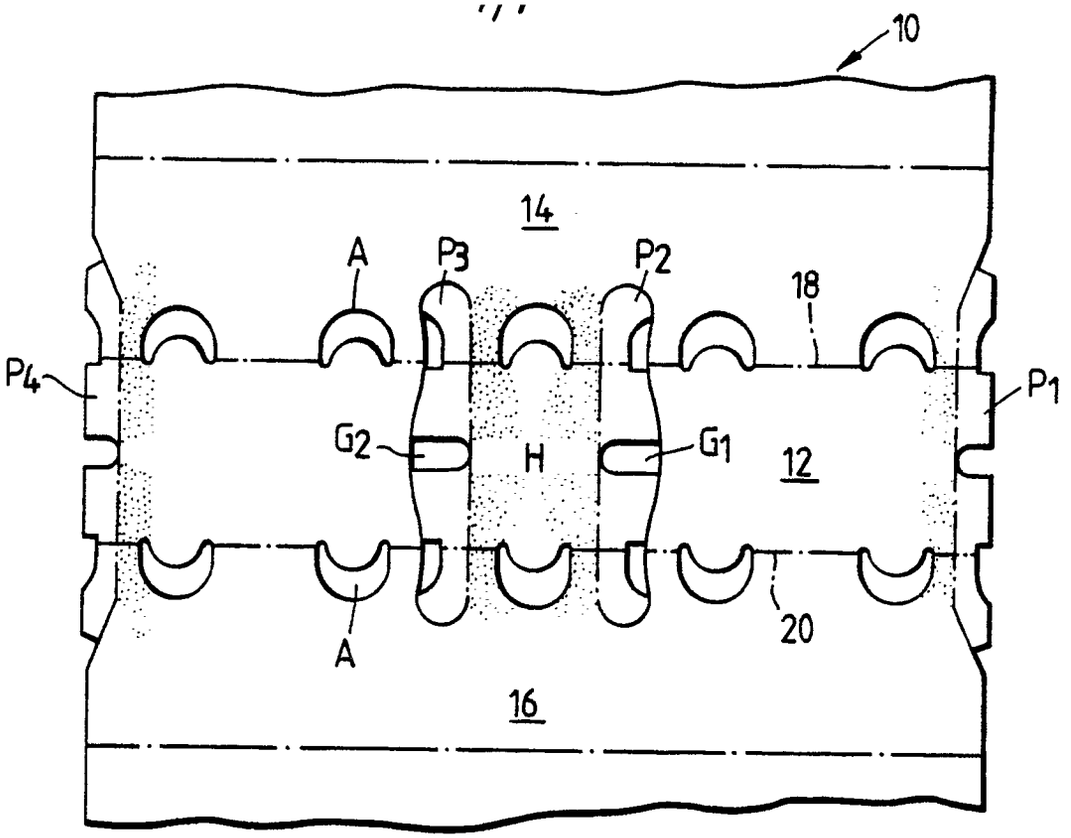
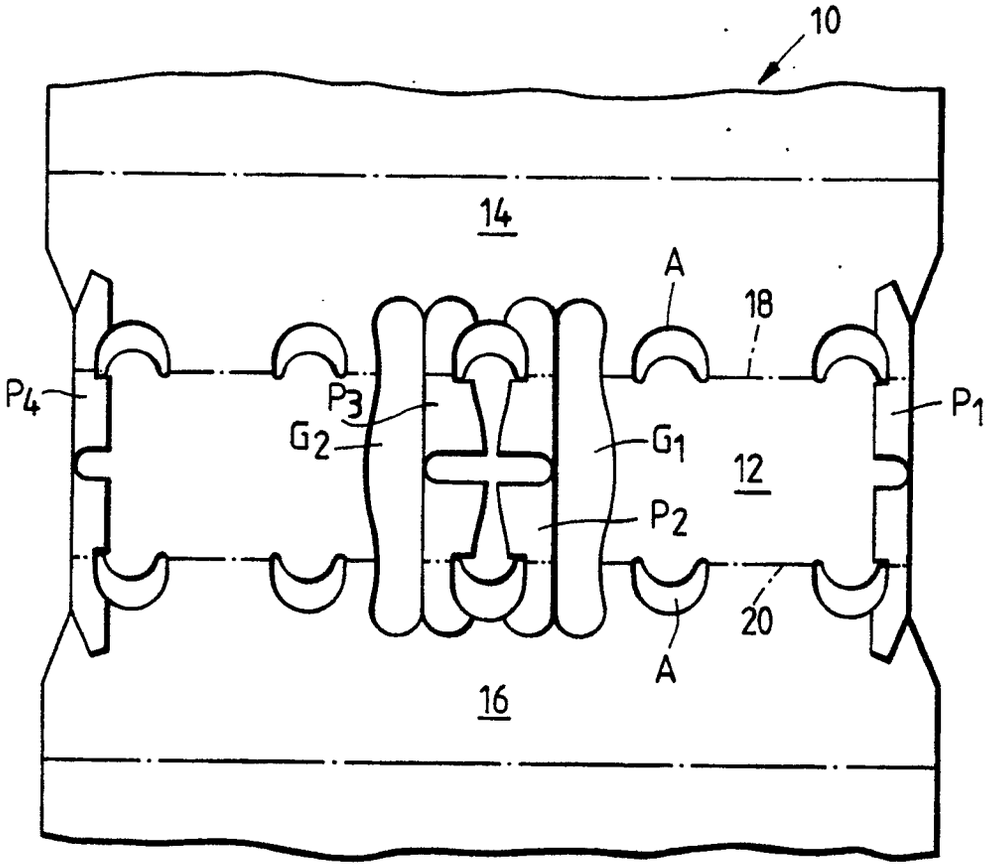

10
14
A
P3
P2
18
P4
P1
G2
H
G1
12
A
20
16

FIG. 1.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P4
P3
P1
G2
G1
12
P2
20
A
16

FIG. 1a.

FIG.2.

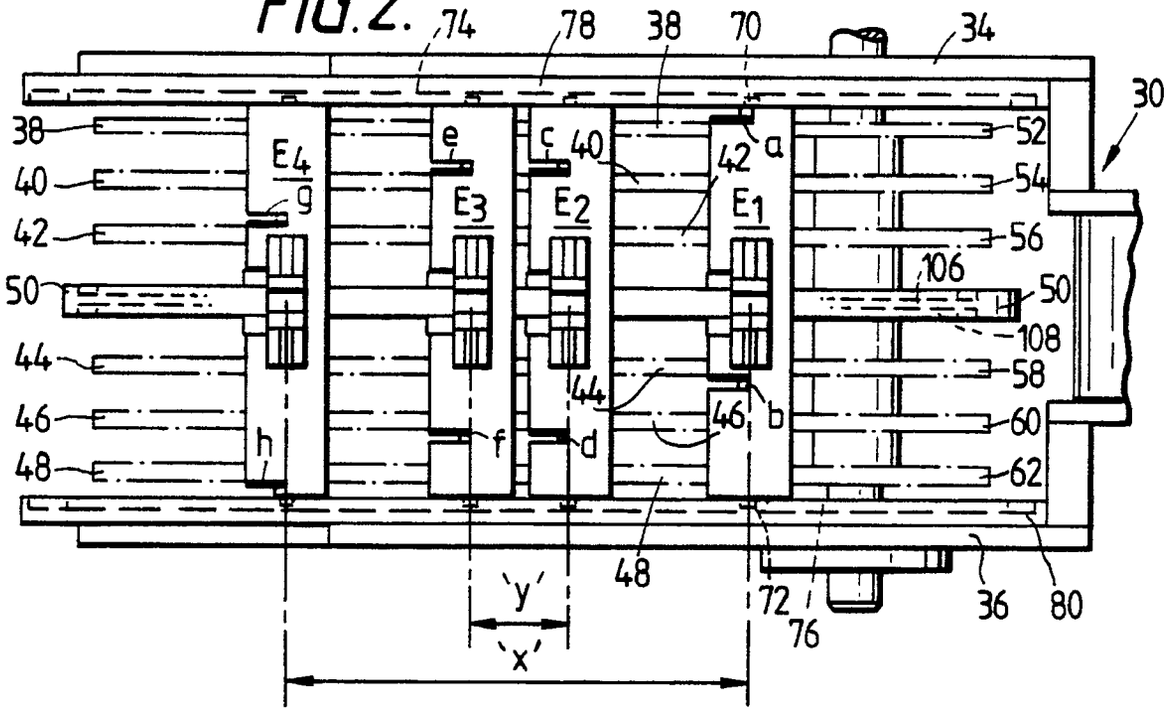
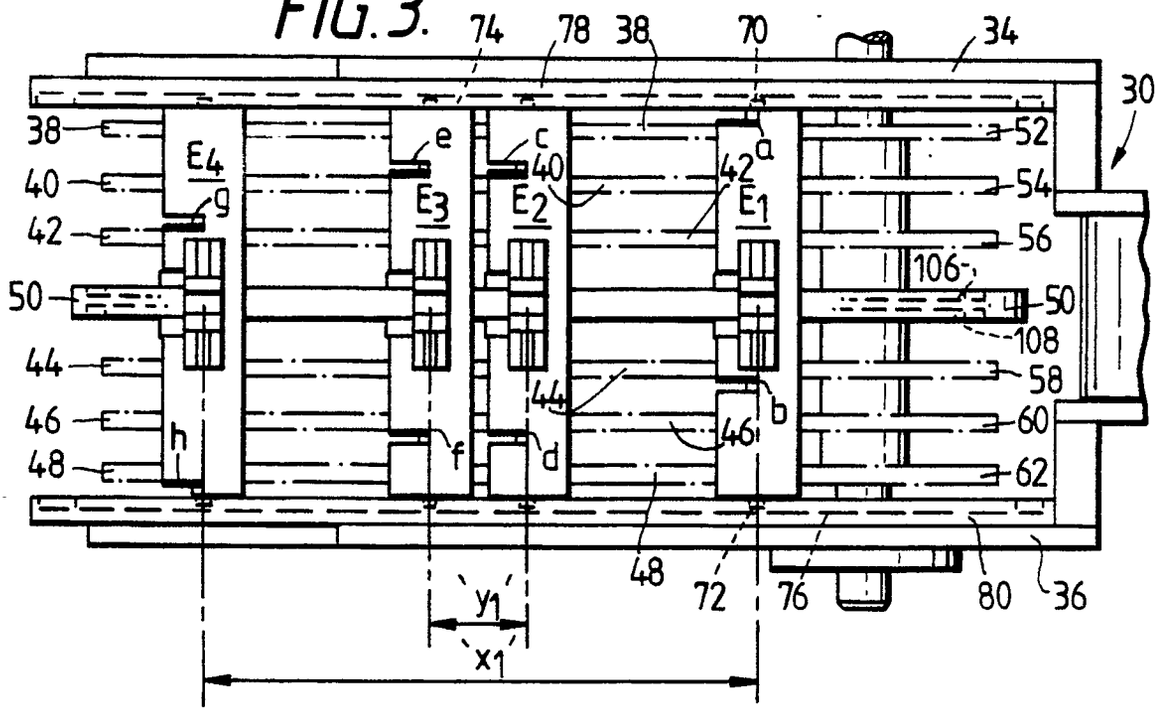

74
78
38
70
34
30
38
40
42
50
44
46
48
E4
g
h
e
E3
f
c
40
E2
d
42
E1
a
b
44
46
52
54
56
106
50
108
58
60
62
48
72
76
36
80
y
x

FIG.3.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70
34
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48
E4
g
h
e
E3
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c
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E2
d
42
E1
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56
106
50
108
58
60
62
48
72
76
80
36
y1
x1

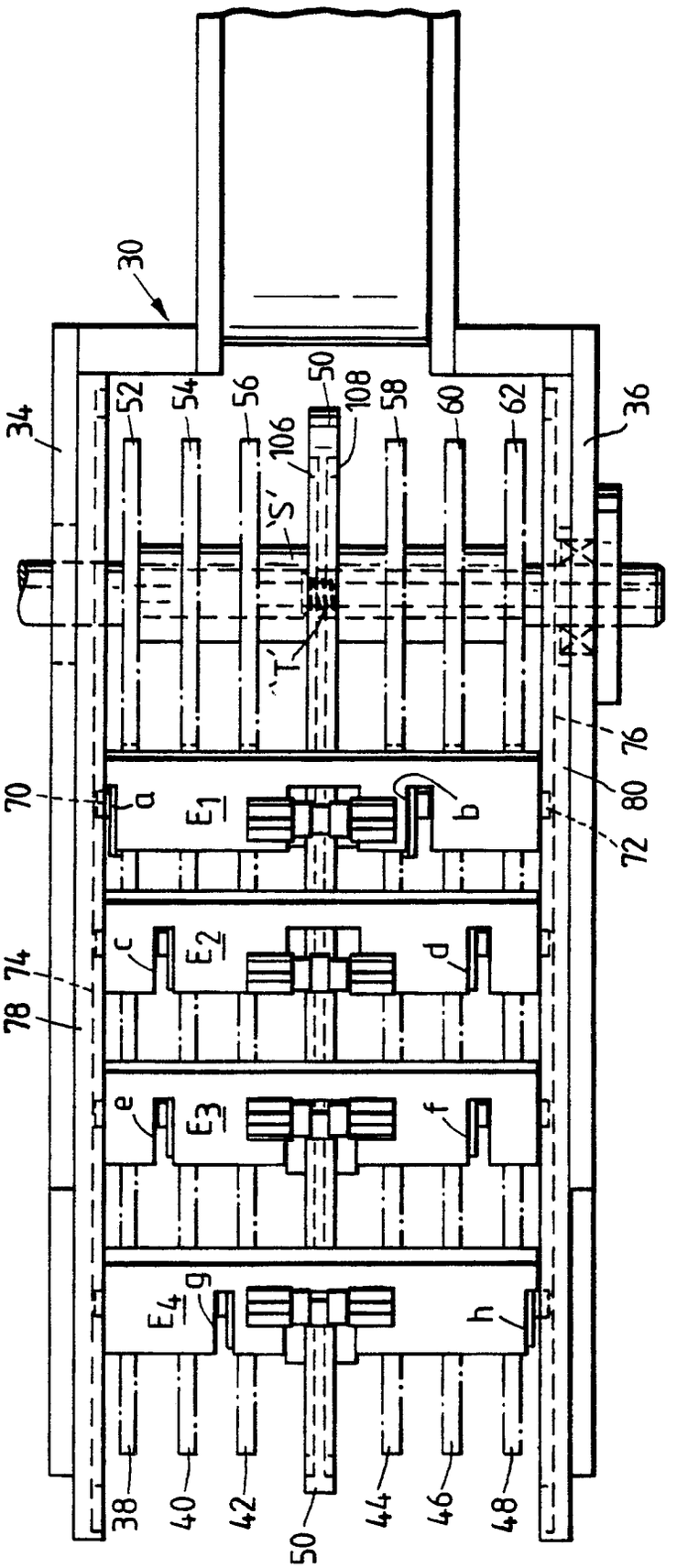
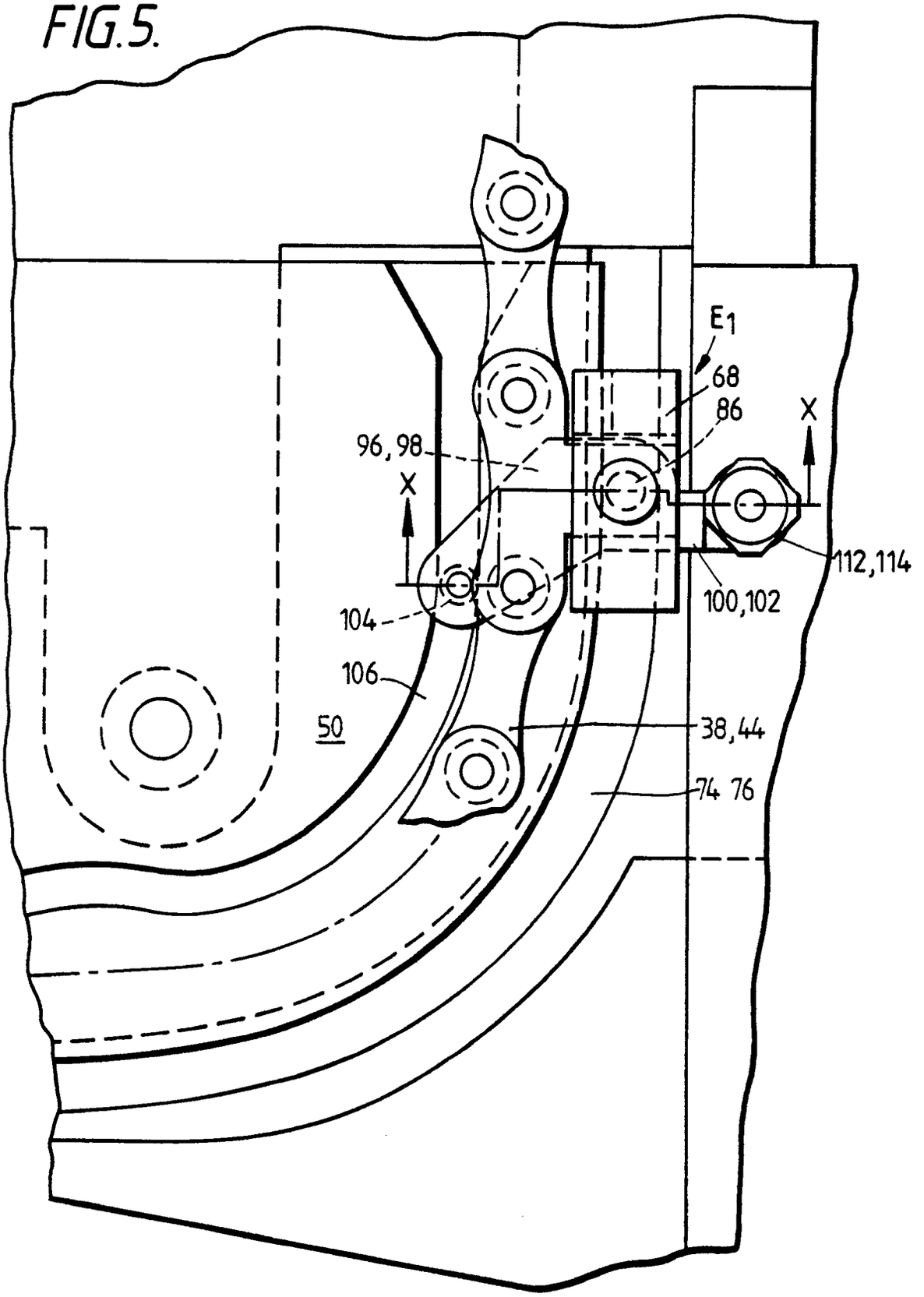

30
34
36
52
54
56
50
108
58
60
62
106
S'
T'
70
a
E1
b
76
80
72
c
E2
d
74
78
e
E3
f
E4
g
h
38
40
42
50
44
46
48

FIG.4.

FIG.5.



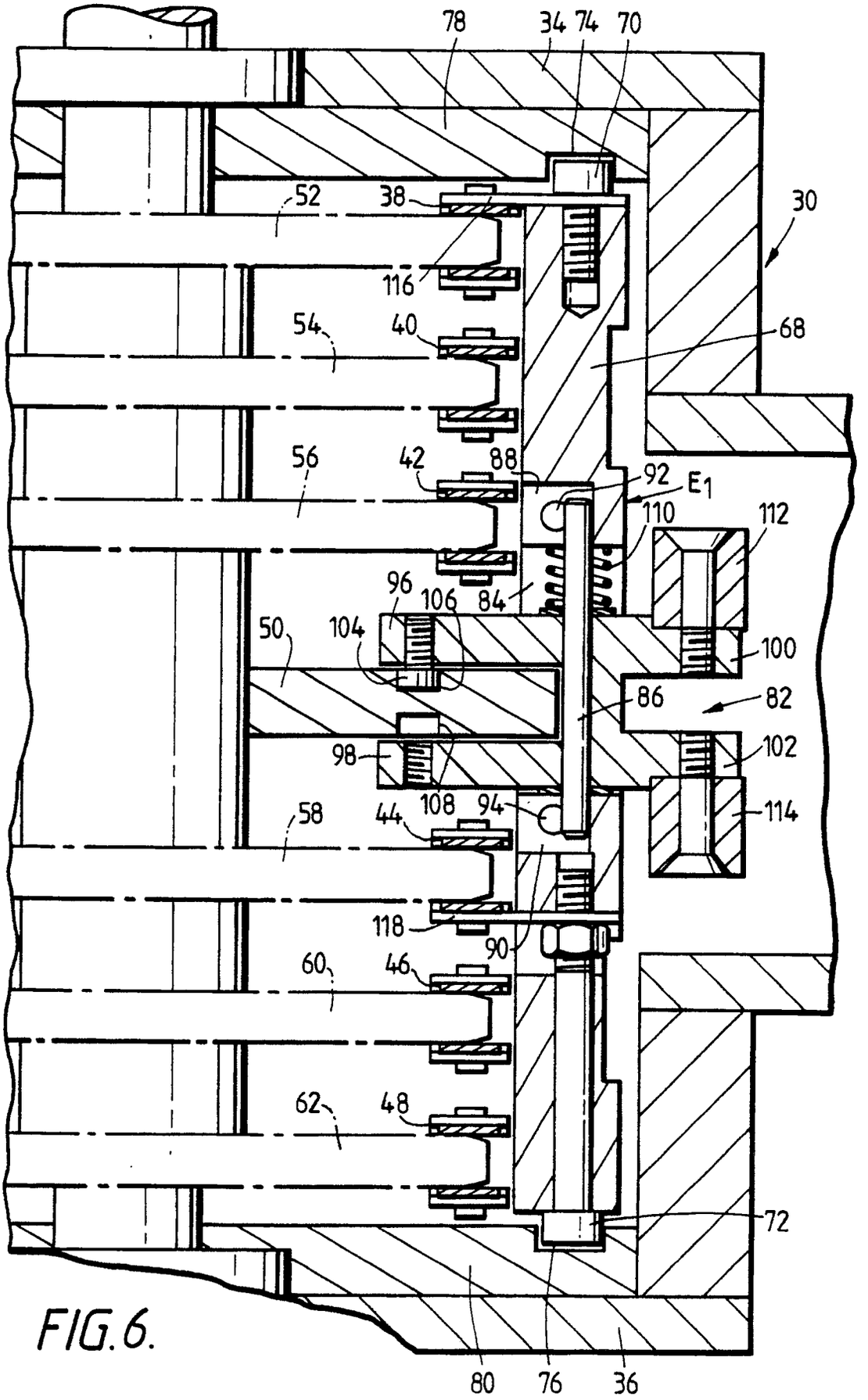

78
34
74
70
30
52
38
116
54
40
68
56
42
88
92
E1
110
112
96
106
84
50
104
100
86
82
98
102
108
94
114
58
44
118
90
60
46
62
48
72
80
76
36

FIG.6.

FIG. 7.

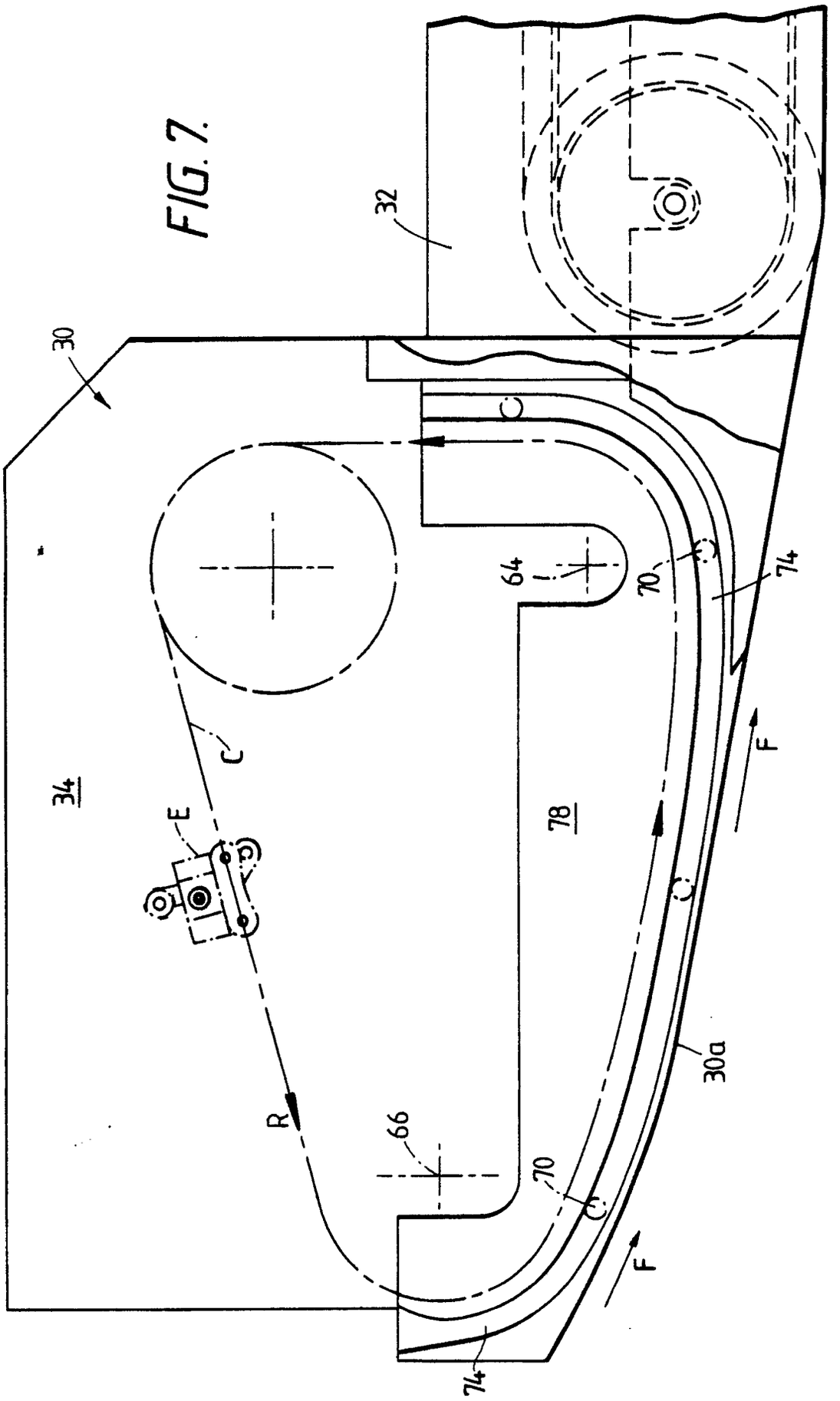
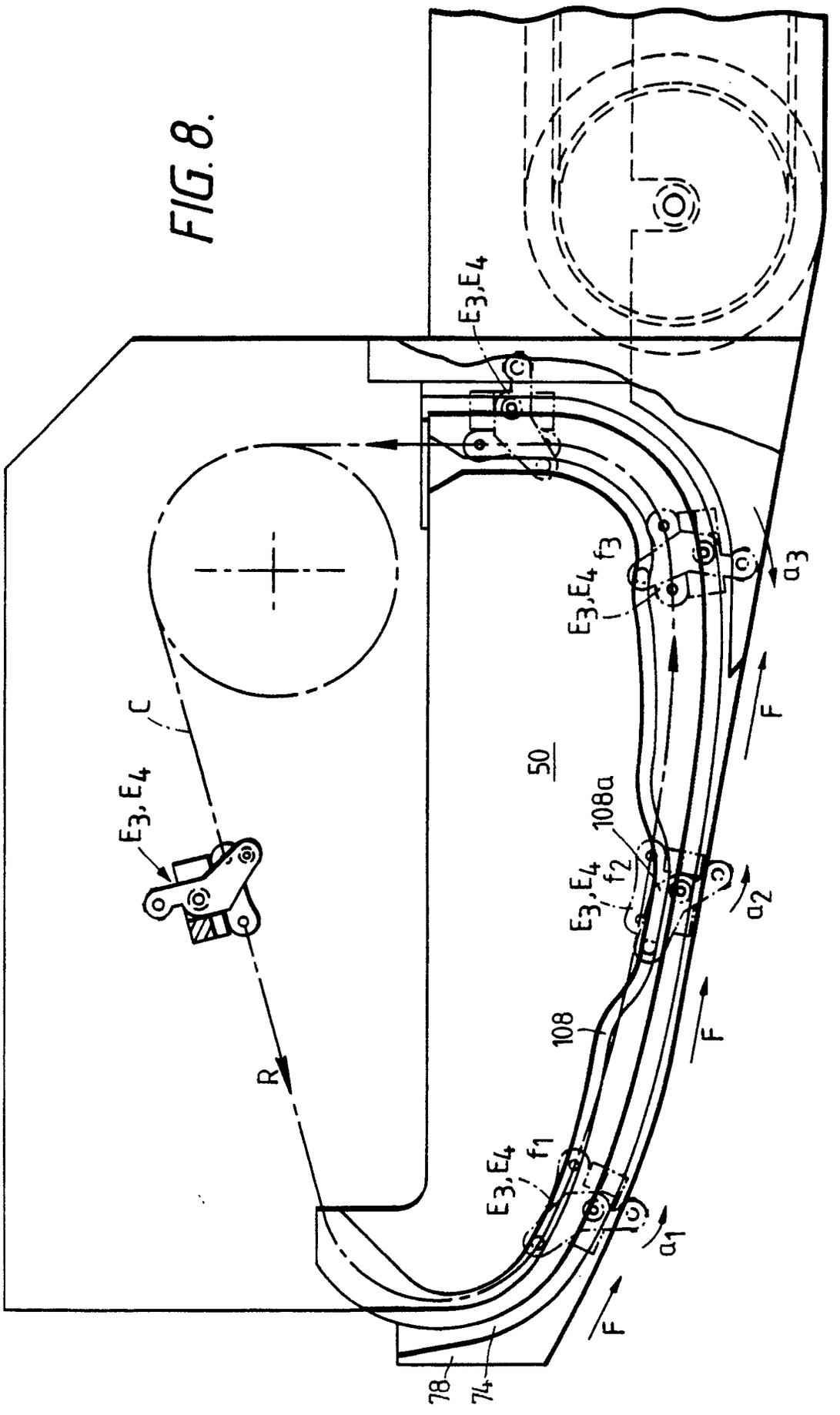


FIG. 8.


E3,E4
E3,E4
f3
a3
F
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108a
E3,E4
f2
a2
C
E3,E4
108
F
R
E3,E4
f1
a1
F
78
74