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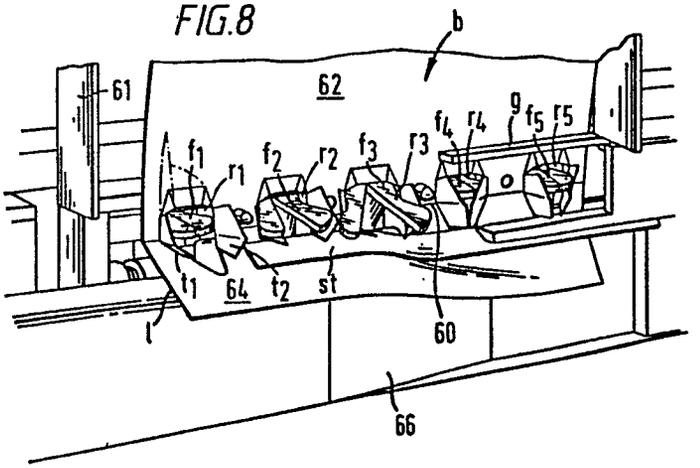
(54) Packaging machine.

(57) In a machine for packaging articles in a tubular wrap-around carrier formed from a blank having a pair of walls adjoined together along a fold line and having a pair of article retaining and blank re-inforcing flaps disposed astride the fold line, and which includes means for advancing a blank and its associated articles along a predetermined path, a mechanism for engaging and folding the pair of flaps and to fold such flaps inwardly of the carrier. The folding mechanism comprises a pivotal folder 'f' adapted to execute a folding movement thereby progressively to enter an aperture in the blank to fold the flaps and to retract therefrom during feed movement of the blank and the pivotal folder together through a folding station of the machine.

FIG.8



EP 0 200 445 A2

Croydon Printing Company Ltd.

PACKAGING MACHINE

This invention relates to a folding mechanism in a machine for packaging articles in a tubular wraparound carrier formed from a blank having a pair of walls adjoined together along a fold line and having a pair of article retaining flaps disposed astride the fold line, and which includes a conveyor for advancing a blank and its articles along a predetermined path. The mechanism folds such flaps inwardly of the carrier. The invention is concerned with the inward folding of such pairs of flaps cut from an open-ended tubular wrapper to define article receiving apertures. The two flaps of each pair of flaps are engaged and folded inwardly while the adjacent portions of the blank are held against substantial sidewise movement by suitable guide means.

The invention provides, in a machine for packaging articles in a tubular wrap-around carrier formed from a blank having a pair of walls adjoined together along a fold line and having a pair of article retaining and blank reinforcing flaps disposed astride said fold line and which includes means for advancing a blank and its

associated articles along a predetermined path, a mechanism for engaging and folding said pair of flaps and to fold such flaps inwardly of the carrier, said folding mechanism comprising a pivotal folder adapted to execute a folding movement thereby progressively to enter an aperture in the blank to fold the flaps and to retract therefrom during feed movement of the blank and said pivotal folder together through a folding station of the machine, said pivotal folder including a blank engaging portion and means for cooperation with actuating means to pivot the folder thereby to execute said folding movement and said retracting movement characterised in that said blank engaging portion comprises a pair of divergently pivotal fingers adapted to move apart consequent upon said folding movement of the folder.

An embodiment of the machine will now be described, by way of example, with reference to the accompanying drawings, in which:

FIGURE 1 is a side elevation of the mechanism with the folding station centrally disposed;

FIGURE 2 is a schematic plan elevation of the mechanism;

FIGURE 3 is a cross-sectional view taken along the cranked line III-III in Figure 1;

FIGURES 4 to 8 are sequential views of the folding station of the mechanism showing pivotal folders executing a folding and retracting movement in relation to a carton blank; and

FIGURES 2 to 12 are plan views showing in sequence the pivotal movment of the folder finger away from one another during folding movement of a folder.

Referring first to Figures 1 and 2 of the drawings, the blank folding mechanism 10 comprises two pairs of chain and sprocket sets; an upper set 12 and a lower set 14. The upper chain and sprocket set 12 comprises spaced sprockets 16 and 18 respectively, about which is entrained endless chain 20. Similarly, the lower chain and sprocket set 14 comprises spaced sprockets 22 and 24 respectively, about which is entrained chain 26.

The blank folding mechanism is adapted to be installed adjacent the infeed end of a packaging machine. Two such mechanisms are installed in side-by-side relationship so that a blank and article feed path is provided between the mechanisms. The description hereinafter refers to the right-hand mechanism of the pair as viewed when looking downstream of the blank and article feed path 'F'.

In order to transmit drive to mechanism 10 a drive sprocket assembly 30 is driven from a suitable drive source (not shown) and includes upper sprocket 32 and lower sprocket 34 fixed on the same drive shaft 36 of the assembly. Drive sprocket 32 transmits drive via endless chain 38 to sprocket 16a which is coupled for rotation with sprocket 16 of the upper chain and sprocket set. Drive sprocket 34 transmits drive via endless chain 40 to sprocket 24a which is coupled for rotation with sprocket 24 of the lower chain and sprocket set. It will be seen that sprockets 16 and 18 of the upper chain and sprocket set 12 have their axes displaced longitudinally of the mechanism with respect to the axes of sprockets 22 and 24 of the lower chain and sprocket set 14. The longitudinal spacing between the adjacent upper and lower sprockets at each end of the mechanism is equivalent to the distance between the attachment locations 'A', 'B' of a blank folding device 42 mounted in the space between the upper and lower chain and sprocket sets 12, 14 respectively. A series (in this case, four) of similar devices 42, 42a, 42b and 42c is mounted between the chain and sprocket sets and each device is attached at location 'A' adjacent one of its ends to upper chain 20 and at location 'B' intermediate its ends to lower chain 26.

The endless chains 20 and 26 are driven in synchronism and thus each blank folding device is moved along the chain paths. In operation of the mechanism each blank folding device is moved by the chains 20, 26 along a

along a working path 'W' parallel to the blank and article feed path 'F' and transversely between sprockets 16 and 22 downstream of the working path to transfer for movement along a return path 'R' whereafter the device is transferred between sprockets 18 and 24 into a position upstream of the working path to complete one cycle of operation. It will be deduced that the mode of attachment of each blank folding device to the upper and lower chains necessarily causes the transverse movement of the device at the ends of the working and return paths to occur so that the longitudinal axis of the device remains parallel to the working and return paths and such that the outward facing side of the device always faces towards the blank and article feed path.

Referring now also to Figure 3, each blank folding device e.g. device 42 comprises a frame 44 by which the device is attached to the endless chains 20 and 26 and which accommodates a linear series of pivotal folders f1-f5. The folders are mounted for pivotal movement independently of each other on a support shaft 46 spanning the length of frame 44 and are axially resiliently loaded by an end spring 48.

Each folder 'f' (see 'f1' in Figure 3) comprises an upstanding lug 50 which is rotatably mounted on shaft 46, a blank engaging portion 52 extending in one direction outwardly of the frame at the upper end of the lug and a cam follower 54 extending in the opposite direction outwardly of the frame at the lower end of the lug. The blank engaging portion 52 of each folder comprises a pair of pivotal fingers fa and fb.

As each blank folding device moves along its working path 'W' it passes through a folding station 'S' in which a cam block 56 is disposed behind the working path of the device. Cam block 56 is formed with a contoured cam track 58 in which the followers of the folders 'f' ride to control pivotal movement of the

folders. Referring also to Figures 4 to 8, Figure 4 illustrates the upstream end of the folding station 'S' in which a carton blank 'b' of the wrap-around type is moving along the feed path 'F' in synchronism with folder device 42c. The blank is formed with a linear series of article heel retaining apertures 'r' which are struck along the fold line 60 which foldably connects a side wall panel 62 with a bottom lap panel 64 of the blank. Such heel retaining apertures are provided to receive e.g. heel portions of bottles to assist retention of the bottles in the completed carton. The heel retaining apertures are each defined in part, by foldable reinforcing tabs t1 and t2 which are frangibly connected together by a small nick before the aperture is opened and which are foldable, to open the aperture, into overlapping relationship with adjacent portions of the side wall and base panel of the blank.

Blank 'b' is shown guided between guide bar 'g' and guide strip 'st' in feed path 'F' entering the folding station 'S'. The blank is engaged by folding device 42c as it moves into the folding station 'S' of working path 'W'. Fixed portions 'p' of the frame 44 (Figure 1) are provided with pegs 'pg' (Figures 4-8) which locate in side wall apertures of the blank to maintain the blank and folding device fixed as they move through the folding station. Articles e.g. bottles to be wrapped are conveyed along the feed path 'F' adjacent blank 'b' by feed lugs 61 disposed at spaced locations along upper endless chain 38.

As the folding device and blank move through the folding station 'S', the cam follower of the folder 'f1' enters the cam track 58 and rides up cam profile C1 (Figure 1). This action pivots the folder 'f1' so that the pivotal fingers f1a and f1b move outwardly of the frame 44 together (clockwise as seen in Figure 3) so that they enter in side by side i.e. closed relationship the leading heel retaining aperture 'r1' of the blank and break the nick between tabs t1 and t2

(Figure 4). As forward movement continues the cam follower of folder f1 rides down cam profile C2 thereby retracting the closed pivotal fingers of the folder. Meanwhile folder f2 is actuated by profile C1 to break apart the tabs of aperture 'r2' in similar manner. The position is then as shown in Figure 5. This movement of the pivotal fingers is represented by movement from the position shown in Figure 9 to the position somewhat less forward than that shown in Figure 10 and then back to the position shown in Figure 9.

In Figure 6 the cam follower of folder f1 rides up cam profile C3 which creates a greater secondary pivotal movement of folder 'f1' whereby its pivotal fingers enter aperture r1 to a greater degree than the initial movement described above. Referring to Figures 9-12, this secondary pivotal movement of the folder f1 is characterised by divergent pivotal movement of the fingers f1a and f1b during which their free carton engaging ends move simultaneously away from one another. During forward (folding) movement of the folder f1, the pivotal fingers move from a closed retracted position shown in Figure 9 to an open extended position shown in Figure 12. Each pivotal finger f1a, f1b has a carton engaging end 'e' and a transverse shoulder 'S' remote therefrom including pivot point 'p' located within the frame of the folding device. The shoulder 'S' has a back abutment face 'sb' and a forward abutment face 'sf' disposed so as to strike against a back stop surface 'bs' and a forward stop surface 'fs' respectively of the frame.

In Figure 6 the pivotal fingers of folder f1 have moved forwardly to cam profile position C2 and pivoted to the position indicated by Figure 11 in which forward abutment faces 'sf' have struck forward stop surfaces 'fs' and caused the carton engaging ends 'e' of the pivotal fingers to move apart simultaneously thereby initiating sideways folding of the tabs t1 and t2. Folder 'f2' is

then at cam profile position C2 while folder 'f3' is at cam profile position C1. At this location, the leading edge 'l' of the blank base panel 64 is guided between guide block 66 and guide strip 'st' so that the leading edge of the base panel is guided upwardly into a more horizontal position relative to the side wall panel 62.

At the position shown in Figures 7 and 12, the cam follower of folder 'f1' has reached cam profile 'C4' causing the pivotal fingers to pivot further apart as shown by Figure 12 and reach their pivotal extemities causing further sideways folding of the tabs t1 and t2. Folding of the tabs into overlapping relationship with the side wall and base panels of the blank is augmented automatically by the upward folding action of the base panel. Folder 'f2' is now at cam profile position 'C3' (Figure 11), folder 'f3' is at cam profile position 'C2' and folder 'f4' is at cam profile position 'C1'.

Referring now to Figures 8 and 9, the cam follower of folder 'f1' rides down cam profile 'C5' thereby causing the pivotal fingers of folder 'f1' to retract from aperture 'r1' to their initial positions at which the back abutment faces 'sb' of the pivotal fingers strike the back stop surfaces 'bs' causing the pivotal fingers to close. The base panel 64 of the blank is guided further towards the horizontal. When folding of the base panel is complete, it will underlie the bases of the articles in a row of articles conveyed adjacent mechanism 10. Simultaneously, the other base panel of the blank would have been brought into a similar position in relation to a parallel row of articles by a juxtaposed mechanism. Thereafter, the base panels are engaged by tightening elements (not shown) which draw together the base panels into overlapping relationship and consequentially cause heel portions of the articles to be located in respective ones of the heel retaining apertures 'r'. The base panels are

subsequently secured together preferably by means of cooperating locking tabs and apertures provided in the base panels. Folder 'f2' is meanwhile intermediate cam profile positions 'C4' and 'C5', folder 'f3' is intermediate cam profile positions 'C4' and 'C3', folder 'f4' is at cam profile position 'C2' while folder 'f5' is at cam profile position 'C1'.

When the folding device 42c is transferred through the position of device 42 into the return path 'R' it is conveyed through a re-set station 'RS' as occupied by folding device 42a (Figure 2). The re-set station includes a further cam block 68 (Figure 3) in which a horizontal straight line cam track 70 is formed. The downstream mouth of the cam track 70 is flared to lead in the cam followers of the folders 'f'. Thereafter, the folders are reset during movement through the straight line cam track 70 into a position that puts the followers into alignment with the upstream end of cam track 58; that is, positioned for movement into cam profile C1 to repeat the foregoing cycle of operation on the next succeeding blank.

Thus, when the fingers are pivoted into their extreme outward position, the fingers move apart to engage and fold outwardly the tabs t1 and t2 of a heel retaining aperture 'r' and when the fingers are pivoted into their fully retraced position, the fingers are closed together.

CLAIMS

1. In a machine for packaging articles in a tubular wrap-around carrier formed from a blank having a pair of walls adjoined together along a fold line and having a pair of article retaining and blank reinforcing flaps disposed astride said fold line and which includes means for advancing a blank and its associated articles along a predetermined path, a mechanism for engaging and folding said pair of flaps and to fold such flaps inwardly of the carrier, said folding mechanism comprising a pivotal folder adapted to execute a folding movement thereby progressively to enter an aperture in the blank to fold the flaps and to retract therefrom during feed movement of the blank and said pivotal folder together through a folding station of the machine, said pivotal folder including a blank engaging portion and means for cooperation with actuating means to pivot the folder thereby to execute said folding movement and said retracting movement characterised in that said blank engaging portion comprises a pair of divergently pivotal fingers adapted to move apart consequent upon said folding movement of the folder.

2. A mechanism according to claim 1, further characterised in that said cooperating means comprises a cam

follower which rides in a cam track provided at said folding station, said cam track being contoured so as to cause said folding movement and saidretracting movement.

3. A mechanism according to claim 1 or claim 2, further characterised in that said fingers are provided with a portion for engagement with a fixed stop during folding movement of the folders which stop provides a surface about which the fingers pivot away from one another.

4. A mechanism according to claim 3, further characterised in that said fingers are provided with a portion for engagement with a fixed stop during retracting movement of the folders which stop provides a surface about which the fingers pivot towards one another.

5. A mechanism according to claim 3 or claim 4, further characterised in that said fingers pivot substantially simultaneously.

6. A mechanism according to any of the preceding claims further characterised in that a plurality of similar folders positioned in line are provided in a folding device to be actuated in sequence, said mechanism including at least one such folding device.

7. A mechanism according to claim 6, further characterised in that each folding device is constrained cyclically to execute a working and return motion such that said device moves along a working path in the feed direction of the blank and articles during which said device passes through said folding station and moves along a return path opposite to the feed direction during which said device is remote from the feed path said working and return paths being substantially parallel to said feed path and said device being arranged such that said pivotal folders remain throughout the cyclic movement facing towrads said feed path.

8. A mechanism according to claim 7, further characterised in that said return path includes a reset station in which said folders are put into a position for executing said folding movement at the folding station.

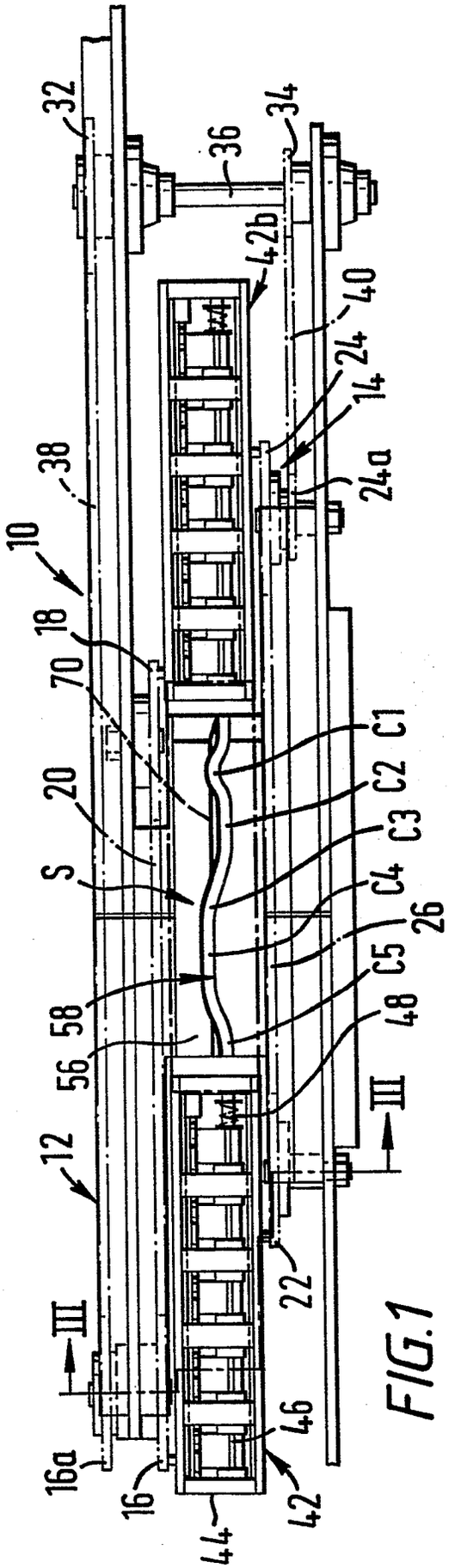

32
36
34
42b
40
24
14
24a
38
10
18
70
C1
C2
C3
C4
C5
20
S
26
58
56
48
III
12
22
III
16a
16
46
42
44

FIG.1

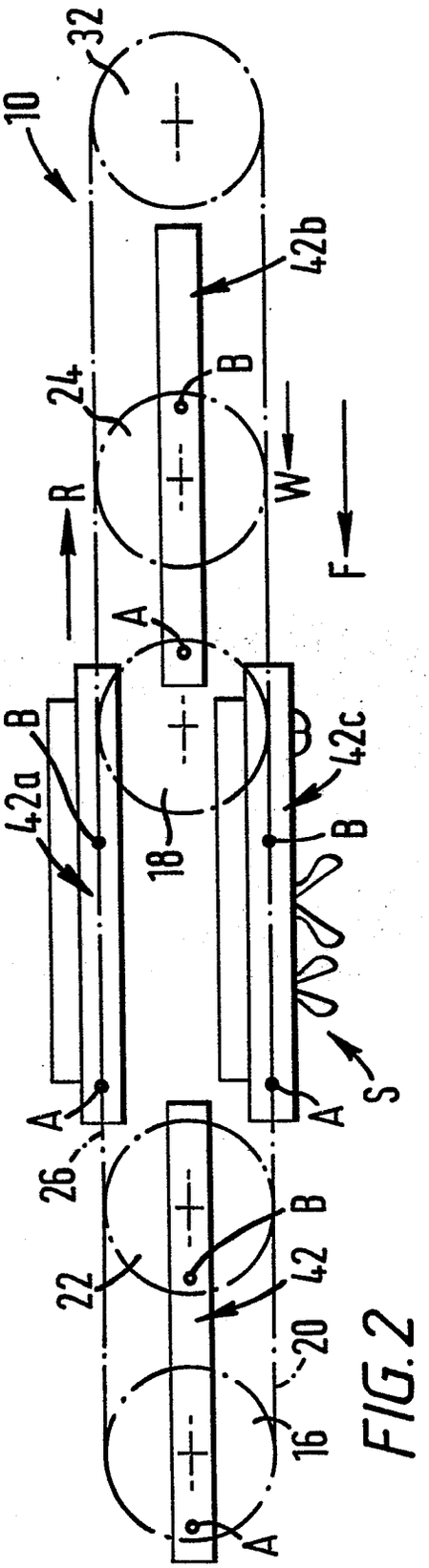

10
32
42b
24
B
R
W
F
A
B
42a
18
42c
B
A
A
S
26
A
22
B
42
20
16
A

FIG.2

FIG.3

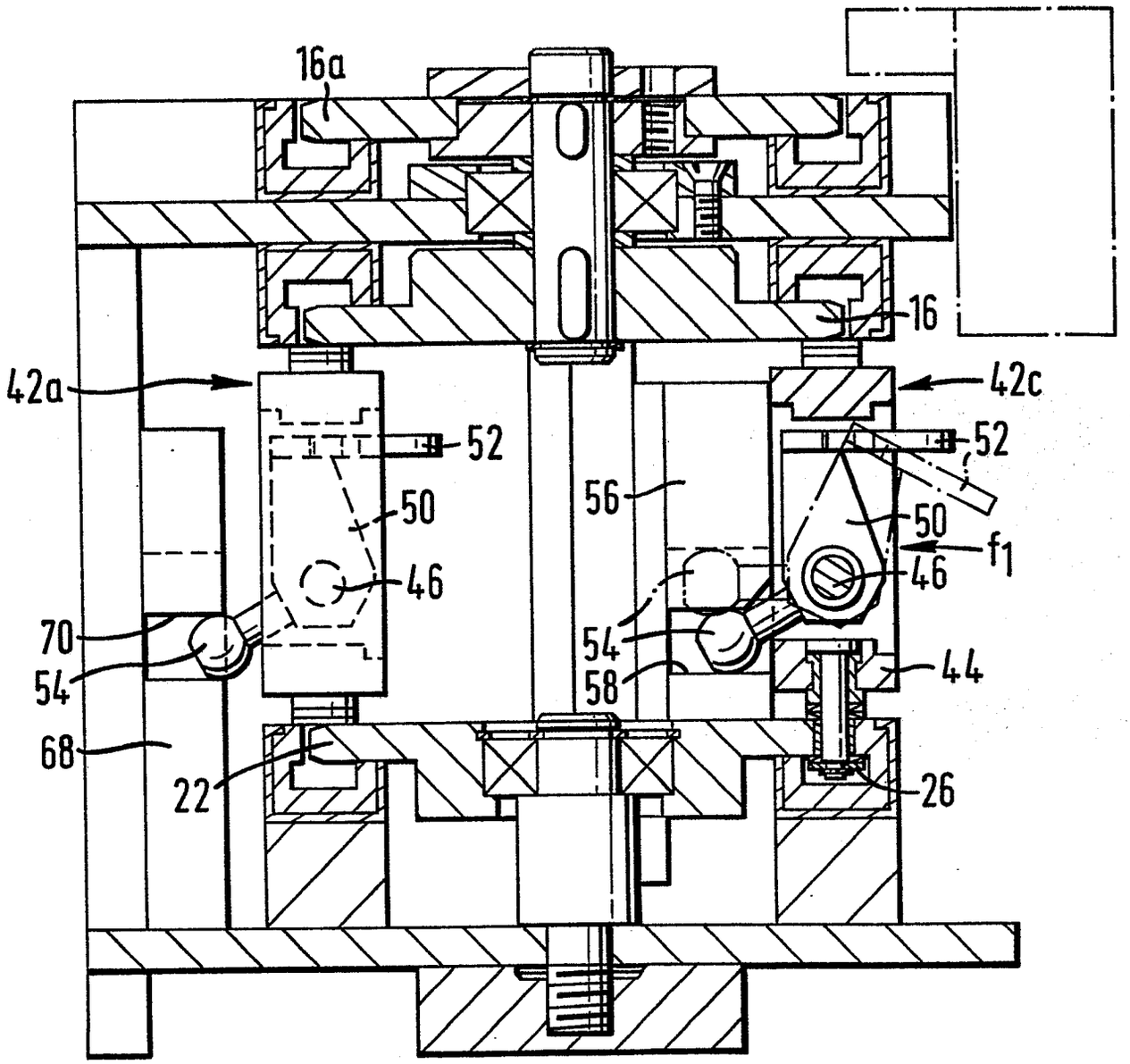


FIG.4

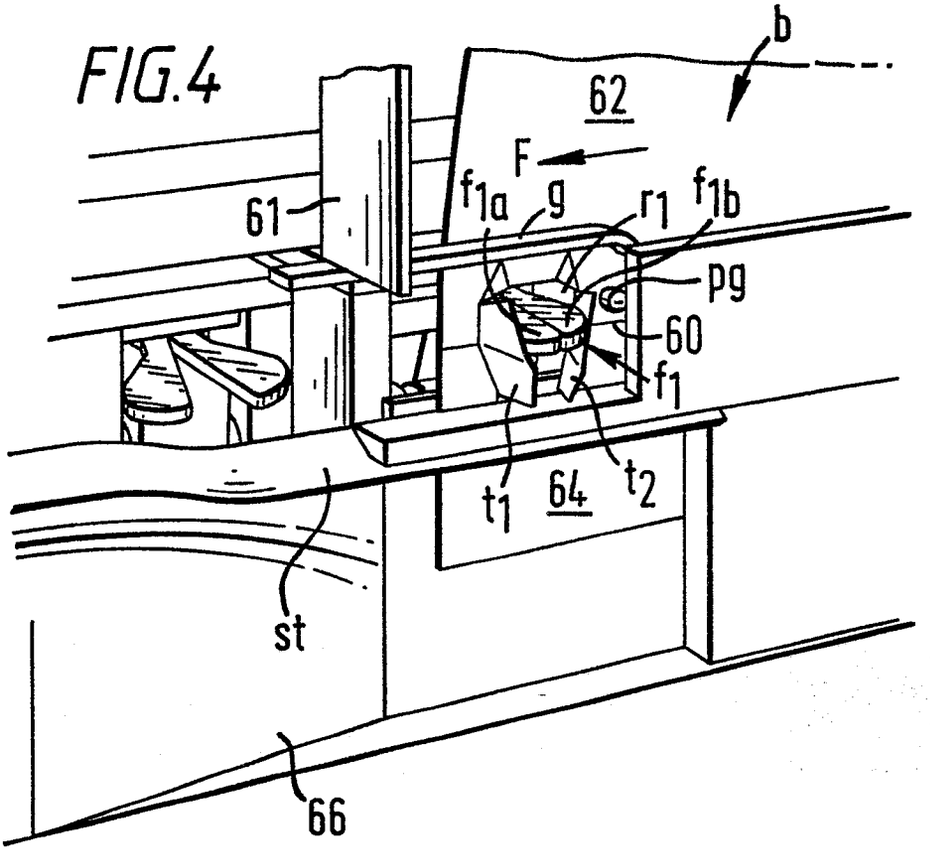

b
62
F
61
f1a
g
r1
f1b
pg
60
f1
t1
64
t2
st
66

FIG.5

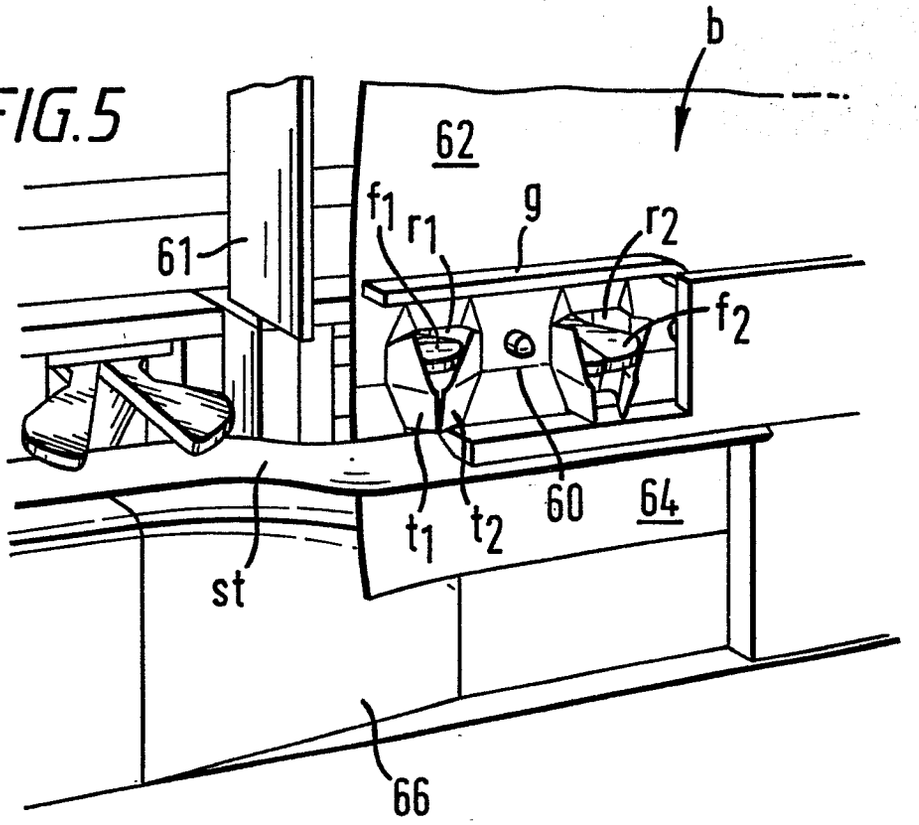

b
62
f1
r1
g
r2
61
f2
t1
t2
60
64
st
66

FIG.6

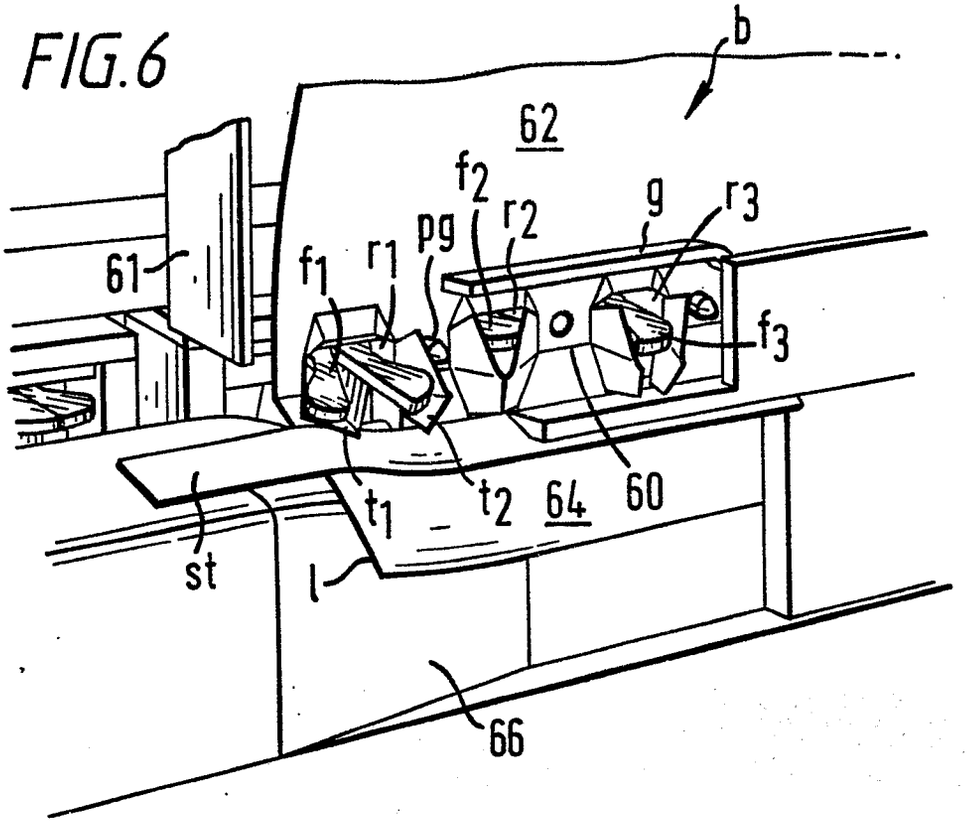

b
62
f2
r2
pg
g
r3
61
f1
r1
f3
t1
t2
64
60
st
l
66

FIG.7

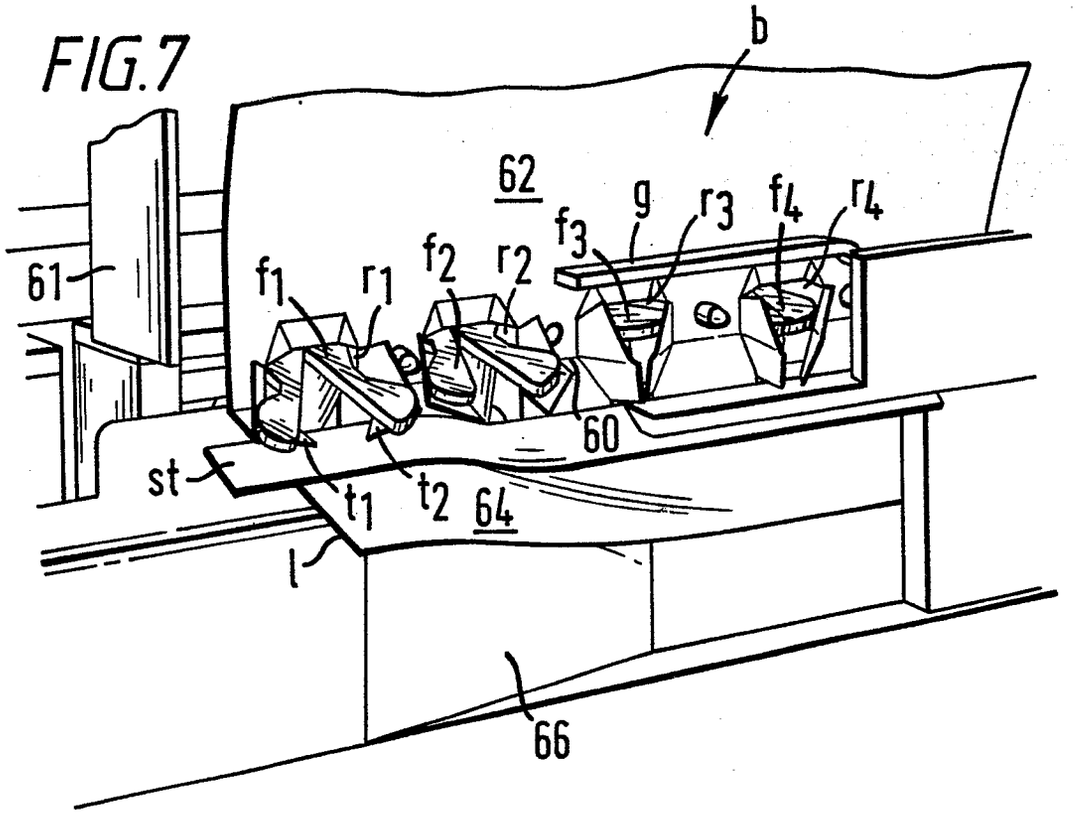
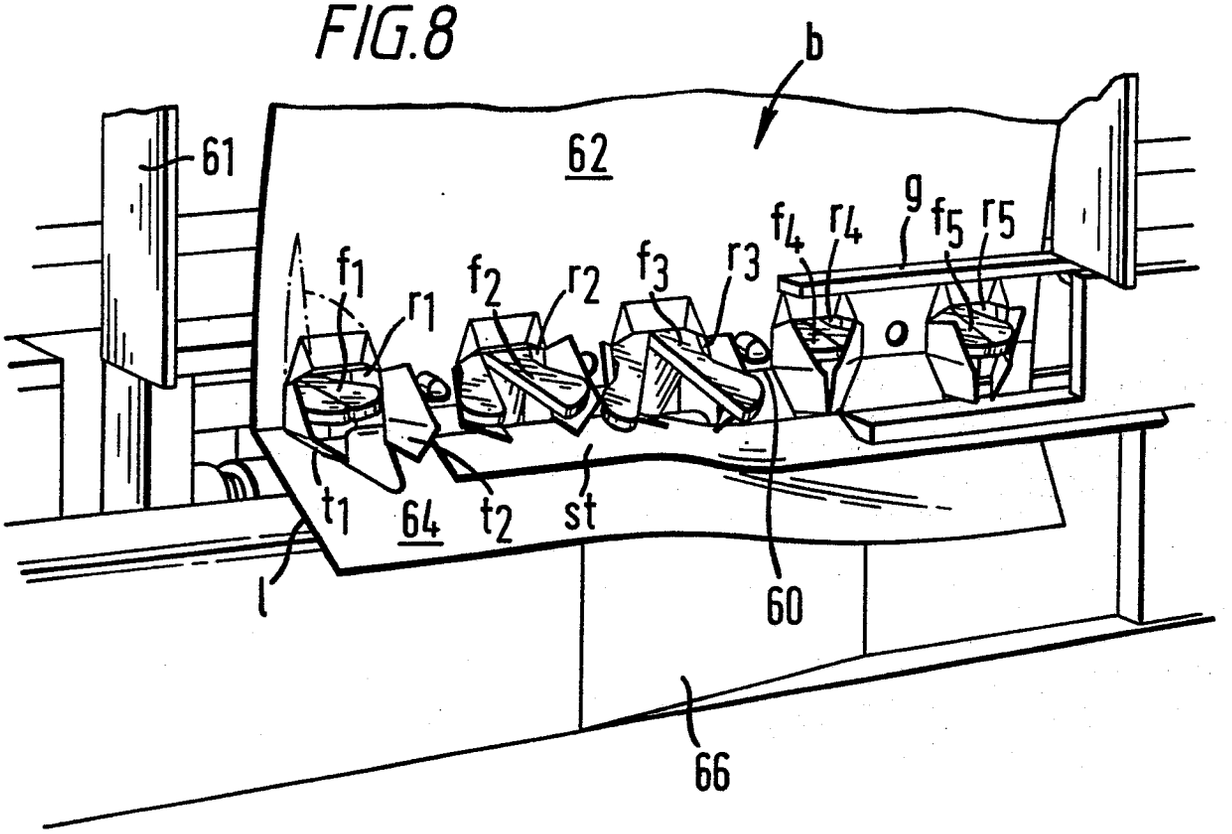

b
62
g
r3
f4
r4
f3
61
f1
r1
f2
r2
60
st
t1
t2
64
l
66

FIG.8



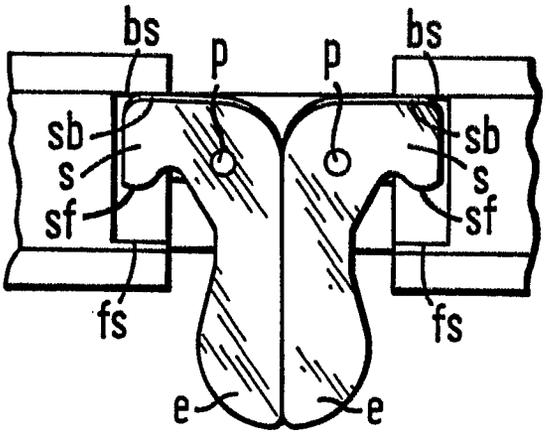


FIG.9

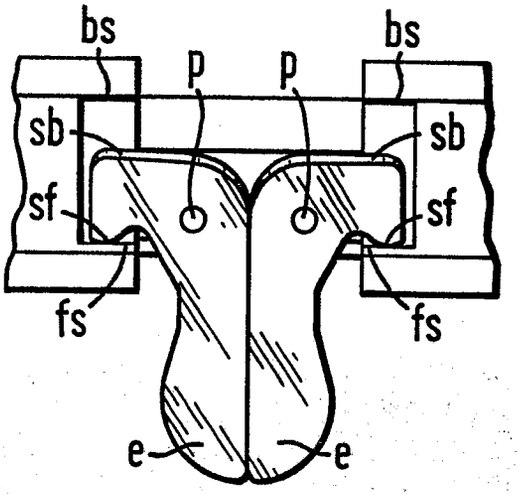


FIG.10

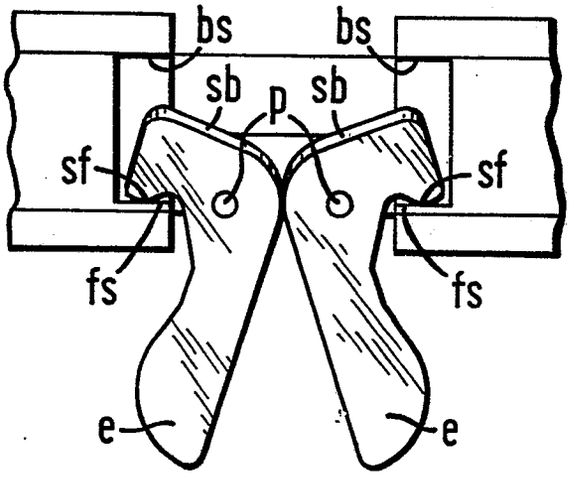


FIG.11

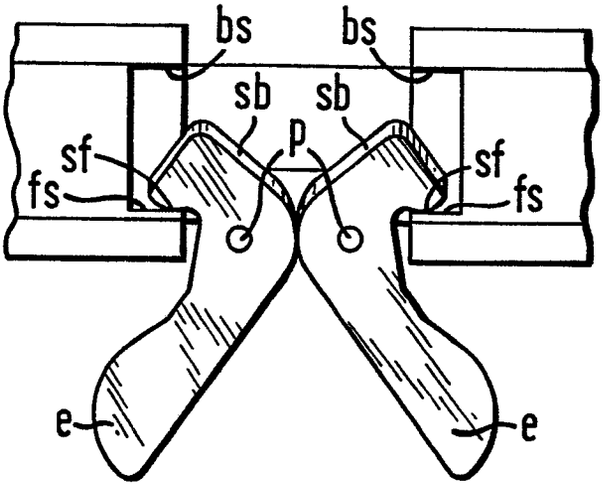


FIG.12