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Device to attach the spine of printed products formed from folded printed sheets with staples

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ABSTRACT

A device (1) to attach staples to the spine of printed products (2) formed from folded printed sheets. The printed products (2) are supplied by means of a transport device (4) with the spines orientated transversely to the direction of transport (F) and positioned successively at a distance from one another. A stapling apparatus having a carrier 7 on which is mounted a staple device 8 formed by a plurality of stapling mechanisms (11) comprising a stapling head (9) and bending device (10). The carrier (7) during the stapling process is driven approximately in the same direction and at least approximately with the same speed as the transport device (4).

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AUSTRALIA
Patents Act 1990

COMPLETE SPECIFICATION
STANDARD PATENT

Applicant(s):

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Invention Title:

DEVICE TO ATTACH THE SPINE OF PRINTED PRODUCTS FORMED
FROM FOLDED PRINTED SHEETS WITH STAPLES

The following statement is a full description of this
invention, including the best method of performing it known to
me/us:

DEVICE TO ATTACH THE SPINE OF PRINTED PRODUCTS FORMED FROM
FOLDED PRINTED SHEETS WITH STAPLES

5 The invention relates to a device for stapling the spine
of printed products formed from folded printed sheets,
said sheets being supplied by means of a transport device
with the spines orientated transversely to the direction
of transport and positioned successively at a distance
from one another.

10 Devices of this type are used, inter alia, for collating
staplers, whereby printed sheets loosely collated to form
printed materials are supplied to a stapling device
joining a collating track.



15 In the production of newspapers, supplements are inserted
into a main product.

20 Newspapers have been distributed for a considerable time
in tabloid format, which comprise several parts, stapled
together. These printed products are described as reader-
friendly and have a higher quality standard.



25 There exists also the desire in newspaper production to
use an insertion machine more economically, for example by
providing the possibility to staple the inserted printed
products, whereby the quality of such printed products
would be further improved by, for example, a special
wrapper and/or a subsequent trimming of the printed
30 products.



35 Devices of the above described type have been provided,
inter alia, by CH-A-667 621 and DE-B-36 45 276, as well as
by the Combi Drum collator stapler manufactured by Ferag
AG, Hinwil, Switzerland. These devices used for stapling
the printed products require high mechanisation, not least
because each saddle-shaped support in the device has a

bending device, so that in the case of forty or more supports on a drum, the device is expensive to manufacture and maintain.

5 DE-B-1'224'329 discloses stapling of printed products inserted into pockets with the folding to the front, while the pockets accommodating the printed products are kept in a vertical position on a rotating drum and pass by a stationary stapling device in the lower region of the
10 drum. The device has a bending device that plunges into the pocket in a direction that is radial to the axis of the drum and has a stapling head that acts against the opposite side. At least because of the long stroke of the bender, this stapling device does not allow a good output
15 capacity.

The present invention provides a device for attaching staples to the spine of printed products formed from folded printed sheets, said sheets being supplied by a
20 transporter which supports the printed products, with the spines of the printed products oriented transversely to the direction of transport, and which positions the printed products successively at a distance from one another, said device comprising:

25 a carrier having at least one stapling mechanism, the stapling mechanism having a stapling head for providing a staple and bending arrangement for bending the staple, for attaching the staples to the spines of the printed products; and
30 drive means for driving the carrier substantially in the same direction and at least substantially at the same speed as the transporter.

The present invention also provides a device for stapling
35 the spine of printed products formed from printed sheets, said device comprising:

a transporter having a plurality of supports for

transporting and supporting the printed products in an open configuration so that access can be gained to the spine of the printed products, the spines of the products being oriented transverse to the direction of travel and the products being positioned successively at a distance from each other; and

a staple device for applying staples to the spine of the printed products, the staple device including:

a carrier mechanism for supporting a plurality of stapling mechanisms;

moving means for moving the carrier in the same direction as the transporter and substantially at the same speed as the transporter;

a bender for bending the staples into a configuration for penetrating the sheets; and

stapling means on the stapling mechanism for forcing a staple through the spine of the printed product and for folding the staple into a closed position after penetration of the staple through the spine of the printed product.

Preferred embodiments of the invention are described with reference to the drawings. The drawings show in:

Fig.1 - a schematic illustration of an embodiment of the device according to the invention,



Fig.2 - a schematic illustration of an alternative embodiment,

Fig.3 - a cross-section along the line III-III of Fig.1,

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Fig.4 - a stabilising device,

Fig.5 - the stabilising device according to Fig.4 with the printed article having a different format size,

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Fig.6 - a bending device,

Fig.7 - a side view of the bending device according to the arrow A of Fig.6,

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Fig.8 - a feed device for a stapling wire,

Fig.9 - stapling of the printed products with the device according to the invention on saddle-shaped supports,

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Fig.10 - a schematic illustration of an alternative embodiment of the device according to the invention,

Fig.11 - a cross-section along the line X-X of Fig.10,

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Fig.12 - a schematic illustration of an alternative embodiment of the device according to the invention, and

Fig.13 - a schematic illustration of another alternative embodiment of the device according to the invention.

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Fig.1 illustrates a device 1 to staple the spine of printed products 2 formed from folded printed sheets which are inserted into insertion pockets 3 of a transporter 4. In one embodiment, the transporter 4 provides supplements which are to be inserted into a main product (such as a newspaper). This process of newspaper production is known

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and therefore does not require further detailed explanations. The insertion pockets 3 are fastened to rotating chains and have means to open and keep open the printed products supplied. In the embodiment illustrated, the pages of the printed products on each side of the spine abut against the walls 5, 6 respectively of the pockets 3. The pockets 3 may, for example, be made according to those described in EP 0 475 192 A2. The carriers of the printed products in the insertion pocket 3 according to this EP publication are height-adjustable brackets (bottom elements of the pocket) forming the bottom of the insertion pocket 3, that are made to suit the format of a printed product. The device 11 further includes a stapling mechanism 11 which is comprised of a rotatable stapling carrier 7 which carries staple devices 8. The rotatable stapling carrier 7 is provided below the transporter 4. The carrier 7 can be rotated by a motor (not shown) which drives the shaft 12 (see Figure 3) of the carrier 7, or the carrier 7 could be driven from the transporter 4. Due to the varying folding thicknesses of the printed products 2, it may be advantageous if the carrier 7 or the transporter 4 is adjustable relative to the external edge of the folding of a printed product 2, so that the folding will not be kinked in the transition region from the insertion pocket 3 to the carrier 7. The staple devices 8 each includes two stapling heads 9 and two bending devices 10. The bottom elements of the pockets are arranged offset to the inside (that is inwardly of the edges of the product 2), so that the staple mechanisms 11 each formed by the stapling heads 9 and bending devices 10 can interact in an undisturbed manner. The insertion pockets 3 are suspended on the conveyor chain with the bottom end of the pocket 3 angled forward, so that the insertion pockets 3 assume a backward inclined position. The carrier 7 is provided below the transporter 4 and with the transporter 4 defines a tangential contact point. The transporter 4 and carrier 7

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rotate in the same direction and with the same speed. On the circumference of the carrier 7, the staple devices 8 each comprised of the stapling heads 9 and bending devices 10, which interact in pairs, are allocated to an insertion pocket 3 as the transporter 4 moves past the rotating carrier 7, resulting in the carrier 7 having a smaller number of stapling devices 8 than the number of insertion pockets 3 on the transporter 4. Fig.1 shows that the transporter 4 is arranged with a hump shape relative to the carrier 7. The reason for this is the overall height that is to be ergonomically matched to suit the necessary access by the operating personnel and to optimally construct a stapling section, where the stapling is carried out. See also DE-B-36 45 276.



As Fig.2 shows, it is, of course, also possible to provide the transporter 4 in the vicinity of the carrier 7 in a horizontally tangential disposition. It can be seen from Fig.2 that the angle between the inactive position of the bending device 10 (shown by reference 10' in Figure 2) and the active position (shown by 10'' in Figure 2) is smaller than in the case of a curved path of the transporter 4 of Figure 1, so that the time available for the stapling is shorter.



Fig.3 shows a cross-section of the carrier 7 and one of the insertion pockets 3. The carrier 7 is firmly fastened on a drive shaft 12 that is driven according to the cycle of the transporter 4 and is mounted in a machine stand 13. In the embodiment illustrated the carrier 7 comprises two externally situated discs 14 on which the bending devices 10 are fastened and two opposite situated internal stapling head discs 15, on which the stapling heads 9, allocated to each bending device 10, are fastened.



According to Fig.8, cut off wire bits which will form staples are transferred by a dispensing device 48 by means of a carrier 49 to the stapling head 9 and formed into a



C-shape during the transfer by a bender 16 (shown in Figure 7) provided on the stapling head 9 (see also EP 0 629 515 A1). Subsequently the prepared staple is pushed by a driver 17 of the stapling head 9 through the spine of the printed product 2 and bent over on the opposite side of the spine by an anvil 18 of the bending device 10. The driver 17 is actuated by a gear segment 19, driven by a control cam 23 (Fig.3).

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Because the stapling process takes place over a finite period, it is advantageous if the bender 16 is in contact with the product 2 prior to the staple being pushed through the product 2. For this reason the bender 16, guiding the staple into the stapling region, could be moved into early contact with the sheet, for which purpose a lever 20 acting on the bender 16 and controlled by a cam 22 is provided. The levers 20 are pivotally mounted on an axle 21 and joined at the free end with the bender 16. This technical detail can be seen in Fig.3.

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It can be further seen in Fig.1 that the stapling head 9 and the bending device 10 interact in a common stapling plane. From Fig.1 several sequences of a stapling process can be seen. At the eleven o'clock position a stapling head 9 and the bending device 10 are in an idle position. The idle position is also shown in Fig.3 in relation to the stapling head 9 and bending device 10 below shaft 12 in Figure 3. As the stapling head 9 and bending device 10 move towards the 12 o'clock position, the driver 17 (and the bender 16) as well as the bending device 10 are actuated by the respective control cams 22, 23, 24 allocated to them. At the twelve o'clock position, that is also illustrated in Fig.3 (above the shaft 12), the staple has been pushed through the spine of the product 2 and bent over. From this moment on the driver 17, the bender 16, and the bending device 10, move back to the open position. The anvil 18 of the bending device 10 plunges

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into an insertion pocket 3 without damaging the printed product 2 situated therein; and the anvil 18 exits from the insertion pocket 3 also without damaging the product 2. A wedge-shaped pocket promotes this objective because
5 the common stapling plane of the stapling head 9 and of the bending device 10 is tangential to a circle that is concentric within the carrier 7. The stapling plane runs through approximately the longitudinal central region of an insertion pocket 3 (see Fig.1.), whilst the staple is
10 pushed through the product 2 and until the staple is fully closed by the anvil 18.

As shown in Figure 2, in order to close each staple, the anvil 18 of each bending device 10 is pivotally mounted on
15 a support 26 forming a guide 25. In the guide 25 a sliding block 27 is connected with the control cam 24 via a roller 28, the cam causing the movement of the sliding block and actuating a gear rack 29 that is guided in the support 26 and is drive-connected with the sliding block 27. The
20 movements of the gear rack 29 are transferred to a pinion 30, that pivots the anvil 18 of the bending device 10 between the stapling position and the initial position. An unintentional overload, for example by a greater thickness of the spine to be stapled, triggers an overload safety
25 device that is constructed by a rod 31 passing through the gear rack 29, and by a compression spring 32 clamped between the sliding block 27 and the displaceable gear rack 29, as well as a nut or adjusting ring 33 securing the gear rack 29 on the rod 31. During the action of the
30 driver 17 against the anvil 18, the latter rests, via a lever arm 34 (see also Figure 6) connected with the anvil 18, on a partial support track 36 arranged concentrically with the axis of rotation 35 of the rotating staple device 7.

35 Moreover, Figs.3, 6 and 7 show a device enhancing the quality of the staple, that ensures that the legs of the

staple will abut against the internal edge of the spine or fold of the product 2. This second bending device is integrated in the bending device 10. It comprises a double lever 37 that has a controllable lever arm 38 and an actuating arm 39. The controllable lever arm 38 runs on a partial control cam 40 when the staple has been bent and causes the lever arm 39, which is provided with wing-like bending elements 41 to pivot against the at least partly bent legs of the staple which fully bends the legs against the spine of the product 2. The bending elements 41 are moved back to the initial position by means of the tension spring 42 when the arm 28 moves off the cam 40.

Fig.7 shows two adjacent bending devices 10 with right hand device being in the initial or open position, and the left hand device being in the stapling position, in which the anvil 18 has been pivoted into the pocket 3. This drawing also shows the contour of cam 24 which causes movement of the sliding block 27 and pivoting of the anvil 18.

Due to the fact that the common stapling plane of the bending device 10 and of the stapling head 9 deviates from the radial direction, the gear rack 29 and the pinion 30 have helical teeth. The pivoting movement of the bending device 10 shown in the figures could be replaced by another feed movement in the stapling position, for example by a rectilinear or a combined feed movement, wherein this takes place in the stapling plane that moves between the walls 5, 6 of an insertion pocket 3.

As shown in Figures 4 and 5, bottom brackets 45 forming the lower end of the insertion pocket 3 are provided inwardly of the stapling heads 9 and the bending devices 10 acting from both sides, so that the bending devices have a problem-free access to the stapling position. In an advantageous manner the insertion pockets 3 have cut-aways

44 on both sides. Due to the relatively long insertion depth, the sheet metal walls 5, 6 of the suspended insertion pockets 3 form an unstable lower end, for which reason an accurate stapling cannot be reliably carried out. To achieve a great stability and accurate positioning of the insertion pockets 3 during stapling, two centring wheels 46 positioned at a distance from one another are drive-connected with the rotating staple device 7. These centring wheels have gaps 47 which are distributed on their circumferences according to the distance of the insertion pockets 3 arranged on the transporter 4, into which the insertion pockets 3 project in a form-locking manner and consequently ensure great stability during stapling and accurate location of the insertion pockets 3. The ends of the pockets 3 are provided with pivotal cogs 48 which facilitate engagement of the pockets 3 in the gaps 47.

The centring wheels 46 are constructed by rings 53 bolted onto the stapling head discs 15, the rings having the gaps 47 on the outside diameter. To increase their strength, the stapling head discs have ribs 55. The bottom brackets 45 of the pockets are displaceably guided in guideways 54 and adjusted to suit the format of a printed product 2. Fig.4 differs from Fig.5 by the different format of the printed products 2, whereby in Fig.4 the printed product 2 inserted has a width smaller than that of in Fig.5 and the bottom brackets 45 of the pockets are so adjusted in their height that with the open lateral edges the printed products 2 assume approximately the same position to enable their opening about their spine or fold and removal from the insertion pocket 3.

The height adjustability of the bottom brackets 45 of the pockets necessitates the adjustability of the carrier 7, i.e. the latter has a height-adjustable construction relative to the passing bottom bracket 45 of the pocket,

as this is illustrated in Figs.4 and 5.

5 It would be, of course, constructively feasible to arrange the carrier 7 fixed relative to the bottom bracket 45 of the pocket and to construct the transport device 4 adjustably in the region of the stapling, however at this stage this seems to be associated with very high costs.

10 Fig.9 shows the device 1 according to the preferred embodiment of the invention interacting with a transport device 4 conveying the printed products 2 astride saddle-shaped supports 50, where the conveying device 4 operates according to the so called ladder principle disclosed, for example, in EP-A-0 095 603.

15 The device 1 according to the preferred embodiment of the invention can be, of course, also used in the case of a so called drum collator stapler, instead of that disclosed in EP-A-0 399 317, 0 476 718, 0 546 326, 0 569 887, 0 606 555.

20 With regard to Fig.9 the printed products 2 are transported on the supports 50 orientated transversely to the direction of transport F. These supports 50 are held on lateral rollers 51 guided in guide blocks and extend approximately tangentially to a stapling circle formed by the stapling mechanism 11 fastened on the carrier 7. As has already been noted in relation to Fig.2, a rectilinear tangent would result in a shorter stapling section. Fig.9 shows again sequences of the stapling process on the transporter 4. At the five o'clock position, stapling head 9 and the bending device 10, reach the stapling section where the stapling process commences. The bender 16, loaded with a staple, is so constructed that it will
25 contact the spine of the printed product 2 and immediately afterwards between six and seven o'clock the stapling cycle is triggered, i.e. the anvil 18 of the bending
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device 10 is displaced or pivoted into the stapling position and triggers the stapling impact of the driver 17. As has been described above, the bending device 10 may be provided with bending elements 41 which can be actuated and carry out an additional movement towards the legs of the staple.

An alternative device 1 according to another embodiment of the invention is shown in Figs.10 and 11, which can operate with both pocket or saddle type transporters 4. The embodiment illustrated is intended for the stapling of printed products 2 transported in insertion pockets 3. As already illustrated in Fig.2, for this purpose a transporter 4 is provided with insertion pockets 3 fastened consecutively at a distance from one another on a traction means.

Parallel to the direction of transport *F*, at least along one stapling section, on which the staples are anchored in the printed products 2, the carrier 7 constructed as a carriage 60 is moved in a reciprocating manner in a guide 62. Accordingly, the stapling mechanisms 11, aligned with the incline of the pockets, follow the insertion pockets 3. For this purpose the carriage 60 is connected with a crank drive 61, that is driven by an electric motor 63. Fig.10 shows a crank wheel 64, crank pin 65 and a crankshaft 66 connected to the carriage 60. The active length of the guide 62 is illustrated on both sides of the carriage 60 by dotted lines. A double arrow *Z* indicates the reciprocating movement of the carriage 60. The electric motor 63 is controlled or regulated to assure that the carriage 60 and the stapling devices 11 follow the insertion pockets 3 with the same speed and in the same direction. The embodiment according to Fig.10 provides for two pairs of stapling mechanisms 11, which are positioned consecutively behind one another and extend transversely to the direction of transport or the movement

of the carriage. The use of a single pair of stapling mechanism would, of course, also be possible; however, to be available in time for the next stapling process higher accelerations would be necessary for the return stroke of the carriage 60 or in the case of one pair of stapling mechanism the speed of the transport device 4 has to be considerably reduced. Naturally, more than two pairs of stapling mechanisms could also be placed on the carriage 60, for which purpose an acceleration of greater masses would be necessary.

When compared with Fig.9, instead of the transporter 4 with insertion pockets 3, a transporter 4 having saddles for supporting the printed products 2 could be used.

The carriage 60 has the same stapling mechanism 11 as described in Figs 1 to 8. The carriage 60 is provided as a carrier 7 and the mechanisms 11 fastened on the latter form again a unit that can be used for the stapling of printed products 2 both inserted in a pocket and placed astride a saddle.

The difference between the embodiments is rotating and rectilinear moving carriers 7. The driving means of the bender 16 and of the driver 17 in the stapling heads 9 are different in the embodiments illustrated.

Fig.11 illustrates in cross-section the guide 62 constructed from two rods, on which the carriage 60 can be driven in a reciprocating manner perpendicularly to the plane of the drawing. Laterally to the insertion pockets 3, suspended on the transporter 4, two stapling mechanisms 11 each are fastened on the carriage 60. Figure 11 shows anvils 18 pivotally from an initial position to a stapling position, the pivoting being carried out by actuating a gear rack 29 displaceable in a guide 25. The gear rack 29 is connected with a sliding block 27, on which a roller

28, running on a control cam 24, is fastened. The connection of the sliding block 27 and of the gear rack 29 is established by a connecting rod 31, on which a compression spring 32 is arranged between the sliding
5 block 27 and the gear rack 29 to provide a safety device against overload. An adjusting ring or a nut 33 on the connecting rod secures the connection between the sliding block 27 and the gear rack 29. The gear rack 29 engages a
10 pinion 30 mounted in the carriage 60, said pinion rotationally fixedly connected with the bending device 10 constructed as a double lever 37 (see also Fig.7). As it has already been shown and described in Fig.7, in the embodiment according to Figs.10 and 11 one lever arm of the double lever 37 is provided for the form-locked
15 support of the actuating arm 39 and of the anvil 18.

The drive of the stapling heads 9 is provided via a transmission 67 connected with the crank wheel 64, the transmission connecting a stationarily mounted drive wheel
20 69 via a driving toothed belt 68. Other driving means, of course, can also be used. The transfer of the movement of the transmission 67 to one or several stapling heads 9 (stapling drive) takes place first of all by virtue of the reciprocating movement of the carriage 60 via a
25 telescoping shaft 70 with universal joint to a chain transmission 71, that drives a stapling head shaft 72 extending transversely to the reciprocating movement of the carriage 60. At the ends of the stapling head shaft 72 mounted in the carriage 60 an eccentric disc 73 with an
30 eccentric pin 74 is fastened, that parallel to the stapling head shaft 72 passes through a bender block 75 and driver block 76 provided in a block guide 79. The blocks 75 and 76 are drive-connected with the stapling head 9. The bender block 75 connected with the bender 16
35 of the stapling head 9 has an arrow-shaped control cam (designated here as bending cam 77) towards the direction of movement of the stapling head 9, represented by double

arrow H. The control cam 77 receives the eccentric pin 74
in the bending block 75. The driver block 76, drive-
connected with the driver 17, has a control cam (called
here driver cam 78) that extends inclined in the direction
5 of movement H of the stapling head 9 and passes through
the driver block 76 behind the bender block 75. For the
connection with the bender block 75 and driver block 76
the bender 16 and the driver 17 are constructed with an
attachable extension 80 and 81, respectively. Due to the
10 inclined position of an insertion pocket 3 due to the
forward situated bottom end of an insertion pocket 3, the
insertion pocket is aligned with the stapling device 11 in
such a manner that the stapling plane, in which the
stapling head 9 and the bending device 10 move, is
15 situated approximately in the median line of the angle
that is formed by the walls 5, 6 of the insertion pocket
3. The actuating of the bending device 10 commences from
the moment when the insertion pocket 3 and the stapling
plane coincide, but the anvil 18 can protrude into the
20 insertion pocket 3 only when the printed products spread
out in the insertion pocket 3 offer sufficient free space.

Incidentally, the stapling process in the embodiment
according to Figs.10 and 11 and the prerequisites
25 necessary for this are not different from the technical
measures of the embodiments illustrated in prior figures.

A further detailed explanation of Figs.10 and 11 is not
necessary due to the assumed knowledge of a person skilled
30 in the art.

A further embodiment according to the invention is shown
in Fig.12, wherein the carrier 7 is constructed as a
rocker arm 90 driven on a pivoting axle 91 in an
35 oscillating manner. As is the case in the embodiments
according to Figs.10 and 11, on the pivoting end of the
rocker arm 90 two pairs of staple devices 8 are provided,

which have a stapling action in the insertion pockets 3 of a transporter 4 on a radially curved path. The reciprocatingly pivoting stapling heads 9 and the bottom end of the insertion pockets 3 moving on the path and the bottom brackets 45 of the pockets 3 form a stapling circle segment, on which the stapling section is situated. The distance of the pairs of stapling devices 8 corresponds to the distance of the insertion pockets 3 or the bottom brackets 45 of the pockets on the stapling circle segments. The modus operandi of the stapling devices 8 is not different from the previously described embodiments. Due to the regular curvature of the stapling circle and the position of the insertion pockets 3 that deviates from the radial, the stapling planes formed by the movement of the stapling heads 9 and the respective associated bending devices 10 enclose a radially outward opening acute angle.

The pivoting movements of the rocker arm 90 are carried out by a lever arm 92 that is situated opposite the pivoting axle 91 and is connected with the rocker arm 90. A guide roller 93 is situated at the free end of the lever arm 92 and engages a rotating endless control track 94, that is fastened on a driven control shaft 95. The rotational speed of the control shaft 95 and the shape of the control track 94 are so determined that the stapling devices 9 can follow the insertion pockets 3 or their bottom brackets 45 on the stapling section.

Furthermore, endless control blocks 96 and 97 are connected rotationally fixed with the control shaft 95 for the actuation of the bender 16 and the driver 17 of the stapling devices. The actuation of the bender 16 and of the driver 17 is carried out via lever mechanisms 98, 99, which are coupled with lever arm 100, 101 of a toggle lever 102, 103 pivotally mounted parallel to the control shaft 95 with the control block 96, 97 on the one hand and

with a further lever arm 106, 107 on the other hand with the con rods 104, 105 connecting with the bender 16 or the driver 17 of the stapling heads 9.

- 5 For a better understanding the control blocks 96, 97 allocated to the benders 16 and drivers 17 of a stapling head 9 are illustrated in Fig.12 partly on both sides of the oscillating drive.
- 10 Incidentally, a reciprocal exchange of the driving concepts for the staple carrier 7 according to Figs.10 and 11 with the embodiment according to Fig.12 is within the reach of the ability of a person skilled in the art.
- 15 Fig.13 illustrates a further device 1 based on the invention. The object of this is the equalisation of the great inertia forces occurring in the embodiment according to Fig.12, by separating the stapling mechanisms 11 into two rockers 90 driven in opposite directions.
- 20 Fig.13 shows a situation, wherein one stapling mechanism 11 is in the stapling process and moves forward in the direction of arrow V with approximately the same speed as the transporter driven in direction F. The other stapling
- 25 mechanism 11' moves simultaneously in the opposite direction of the transport device 4 and is situated on the return path, i.e. no stapling takes place. The fact that the stapling device 11 is in the stapling process is suggested by the bending device 10 and the stapling head 9
- 30 which are pivoted inward to sandwich a printed product 2. The fact that the stapling device 11' according to arrow R is on the return path to the initial position is illustrated by the open position between the bending device 10' and the stapling head 9'.
- 35 Incidentally, the printed product 2' situated in the insertion pocket 3' had been stapled by the stapling

device 11', whereas the printed product 2'' in the insertion pocket 3'' is yet to be stapled by the stapling device 11. The rockers 90, 90' have a common pivoting axis 91 and for their actuation are connected with the lever arms 92, 92'. The free ends of the lever arms 92, 92' have guide rollers 93, 93', which engage a rotating endless control track 94, 94'. The control tracks 94, 94' are fastened on driven control shafts 95, 95'. The rotational speeds of the control shafts 95, 95' and the shape of the control tracks 94, 94' are harmonised for the stapling process and the return travel in such a manner that during the stapling process the stapling devices 11, 11' follow the insertion pockets 3 and during return travel they reach the initial position at the correct time.

Furthermore, for the actuation of the driver 17, 17' of the stapling devices 11, 11' on the control shafts 95, 95' endless control blocks (not visible) are provided that are engaged by the end of a lever arm 100, 101 of a lever arm 106, 106'. The lever arm 101, 101' situated opposite the pivoting axle of the control lever 106, 106' is connected with the stapling head 9, 9' of a stapling device 11, 11' via con rods 104, 104'. Further conclusions can be obtained from the explanation of Fig.12, wherein, inter alia, the benders of a stapling head are also driven.

In the claims which follow and in the preceding description of the invention, except where the context requires otherwise due to express language or necessary implication, the word "comprise" or variations such as "comprises" or "comprising" is used in an inclusive sense, i.e. to specify the presence of the stated features but not to preclude the presence or addition of further features in various embodiments of the invention.

It is to be understood that, if any prior art publication is referred to herein, such reference does not constitute

an admission that the publication forms a part of the common general knowledge in the art, in Australia or any other country.

SECRET

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A device for attaching staples to the spine of printed products formed from folded printed sheets, said sheets being supplied by a transporter which supports the printed products, with the spines of the printed products oriented transversely to the direction of transport, and which positions the printed products successively at a distance from one another, said device comprising:
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- 10 a carrier having at least one stapling mechanism, the stapling mechanism having a stapling head for providing a staple and bending arrangement for bending the staple, for attaching the staples to the spines of the printed products; and
- 15 drive means for driving the carrier substantially in the same direction and at least substantially at the same speed as the transporter.
2. The device according to claim 1 wherein the transporter has insertion pockets for accommodating the printed products, or saddle shaped supports on which the printed products are supported.
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3. The device according to claim 1 or claim 2 wherein the carrier is a rotor and the drive means is for rotatable driving the carrier.
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4. The device according to claim 3 wherein the carrier and the transporter define a stapling station at which location the staple mechanism inserts the staples into the spines of the printed products.
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5. The device according to claim 3 wherein a plurality of said stapling mechanisms are located on a circumference of the rotary carrier.
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6. The device according to claim 5 wherein the

bending arrangement of each staple mechanism includes a bender for bending staples in the form of wire bits into a C-shaped configuration, and a driver for driving the bent wire bits through the spines of the printed products.

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7. The device according to claim 5 wherein when the insertion pockets or supports reach the stapling station, the stapling station is substantially tangential to a stapling circle formed by the rotor.

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8. The device according to claim 7 wherein the stapling head and the bender form a stapling plane that, during the stapling process, extends between two walls forming one of said insertion pockets, and tangentially to a circle that is concentric and within the stapling circle of the stapling rotor.

15

9. The device according to any one of claims 1 to 8 wherein the carrier includes a coaxially rotatable centring device having a plurality of gaps distributed about the circumference of the centring device, and spaced a distance apart corresponding to the distance, the gaps being for receiving the insertion pockets for supporting the insertion pockets as a staple is applied to the product by the stapling mechanism.

20

10. The device according to claim 6, further including a wire bit carrier for transferring wire bits to the bender.

30

11. The device according to any one of claims 1 to 3, or 4 to 10, wherein the transporter includes saddle shaped supports on which the printed products are supported and the transporter defines a stapling station below the carrier.

35

12. The device according to claim 1 or claim 2 wherein the carrier includes a carriage and drive means

for driving the carriage in reciprocating manner relative to the transporter.

5 13. The device according to claim 12 wherein the carriage is coupled to a crank drive, an electric motor for driving the crank drive to thereby reciprocate the carriage, and control means for controlling the electric motor in synchronism with the movement of the transporter.

10 14. The device according to claim 12 or 13 wherein the drive means drives the carriage in a direction parallel to movement of the transporter, the carriage supporting at least one said stapling mechanism.

15 15. The device according to claim 1 or claim 2 wherein the carrier comprises a rocker arm, a pivot axis for supporting the rocker arm, the pivot axis being arranged transverse to the direction of movement of the transporter, and drive means for driving the rocker arm in
20 an oscillating manner.

25 16. The device according to claim 15 characterised in that the staple mechanism is fastened on a pivotal end of the rocker arm and connected with a lever arm which engages a rotating control track situated opposite the axis about which the rocker pivots.

30 17. The device according to claim 16 characterised in that the control track is provided on a control shaft connected to the transporter in a driven and controlled manner.

35 18. The device according to claim 17 wherein the staple mechanism includes a stapling head having a bender and a driver, control blocks coupled to the control shaft and lever mechanisms connecting the bender and driver to the control blocks.

19. The device according to claim 18 wherein the lever mechanisms have toggle levers pivotal in a direction parallel to the control shaft, the toggle lever having lever arms which are coupled with the control block and with a con rod connecting the bender and the driver.

20. The device according to claim 12 wherein the carriage supports at least two staple mechanisms which are spaced apart by a distance corresponding to the distance between insertion pockets carried by the transporter, and each staple mechanism having a pair of stapling heads and drivers.

21. The device according to claim 5 wherein each stapling head and bender interact in a stapling plane.

22. The device according to claim 21 wherein the stapling plane extends between two walls forming an insertion pocket.

23. The device according to claim 2 wherein the insertion pocket has an inclined disposition in which a bottom portion of the insertion pocket is forward of, or in advance of, a top portion of the insertion pocket in the direction of movement of the insertion pocket on the transporter.

24. The device according to any one of claims 1 to 23 wherein the stapling mechanism further includes a bending device having an anvil, and anvil moving means for moving the anvil between an initial position outwardly of the printed product, to a position inwardly of the printed product and opposed to the stapling head, so that when the driver drives a staple, the staple can penetrate the spine of the printed product and engage the anvil so as to fully bend the staple into a fastened orientation through the spine of the product.

25. The device according to claim 12 wherein the carriage includes a centring device for receiving a lowermost edge of the insertion pocket for supporting the insertion pocket during the stapling process.

26. The device according to any one of claims 12 to 25 characterised in that the stapling heads are connected with an endless wire of a wire dispenser.

27. The device according to claim 24 wherein the anvil is pivotally mounted about a pivot axle which extends perpendicular to a stapling plane, at which staples are applied to the spine of the printed product.

28. The device according to claim 27 wherein the anvil comprises a double lever and includes a lever arm, a partial support track for supporting the lever arm during the stapling process.

29. The device according to claim 24 wherein the bender is drive connected with a cam controlled gear rack drive for causing pivotal movement of the anvil from the initial position to the position opposed to the stapling head.

30. The device according to claim 29 wherein the gear rack drive includes a gear rack, a pinion engaged with the gear rack and the pinion being mounted on the anvil so that when the gear rack is moved, the pinion is rotated to thereby rotate the anvil between the initial position and the stapling position, the gear rack drive being mounted on a guide block which is connected to a control cam in a sliding guide for controlling sliding movement of the guide block and therefore the gear rack drive.

31. The device according to claim 2 wherein the insertion pockets have cut outs at lateral edges of the

insertion pocket for accommodating the stapling mechanisms, and enabling stapling of the printed product supported by the insertion pockets.

5 32. The device according to claim 33 wherein the insertion pockets include two bottom elements located between regions at which the stapling mechanism applies staples to the spine of the printed product.

10 33. The device according to any one of the preceding claims wherein the transporter or the staple device is displaceable relative to the spine of a printed product.

15 34. The device according to claim 15 wherein two opposed oscillating driveable rocker arms form each stapling mechanism.

20 35. A device for stapling the spine of printed products formed from printed sheets, said device comprising:

25 a transporter having a plurality of supports for transporting and supporting the printed products in an open configuration so that access can be gained to the spine of the printed products, the spines of the products being oriented transverse to the direction of travel and the products being positioned successively at a distance from each other; and

a staple device for applying staples to the spine of the printed products, the staple device including:

30 a carrier mechanism for supporting a plurality of stapling mechanisms;

moving means for moving the carrier in the same direction as the transporter and substantially at the same speed as the transporter;

35 a bender for bending the staples into a configuration for penetrating the sheets; and

5 stapling means on the stapling mechanism for forcing a staple through the spine of the printed product and for folding the staple into a closed position after penetration of the staple through the spine of the printed product.

36. The device according to claim 35 wherein the carrier comprises:

10 a rotary carrier having the plurality of stapling mechanisms, each stapling means on each stapling mechanism including a pair of stapling heads having the bender for bending wire bits into an open staple configuration, and a driver for driving the open staple through the spine of a printed product;

15 one anvil being associated with each of the stapling heads; and

20 anvil actuating means for moving the anvils between an initial position outwardly of the printed product to a stapling position inwardly of the printed product and opposed a respective one of the stapling heads, so that when the stapling heads drive a staple through the spine of the printed products, the anvils engage the open staple and close the staple over the spine of the printed product to secure the staple to the spine of the printed product.

25 37. The device according to claim 36 wherein the carrier comprises a carriage, a crank drive for reciprocating the carriage back and forward relative to the transporter, the carriage supporting at least two said staple mechanisms, one behind the other in the direction of oscillating movement of the carriage.

38. The device according to claim 36 wherein the carrier comprises a rocker arm, and the stapling mechanism being mounted on the rocker arm.

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Dated this 1st day of September 2005

GRAPHA-HOLDING AG

By their Patent Attorneys

GRIFFITH HACK

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Fellows Institute of Patent and
Trade Mark Attorneys of Australia

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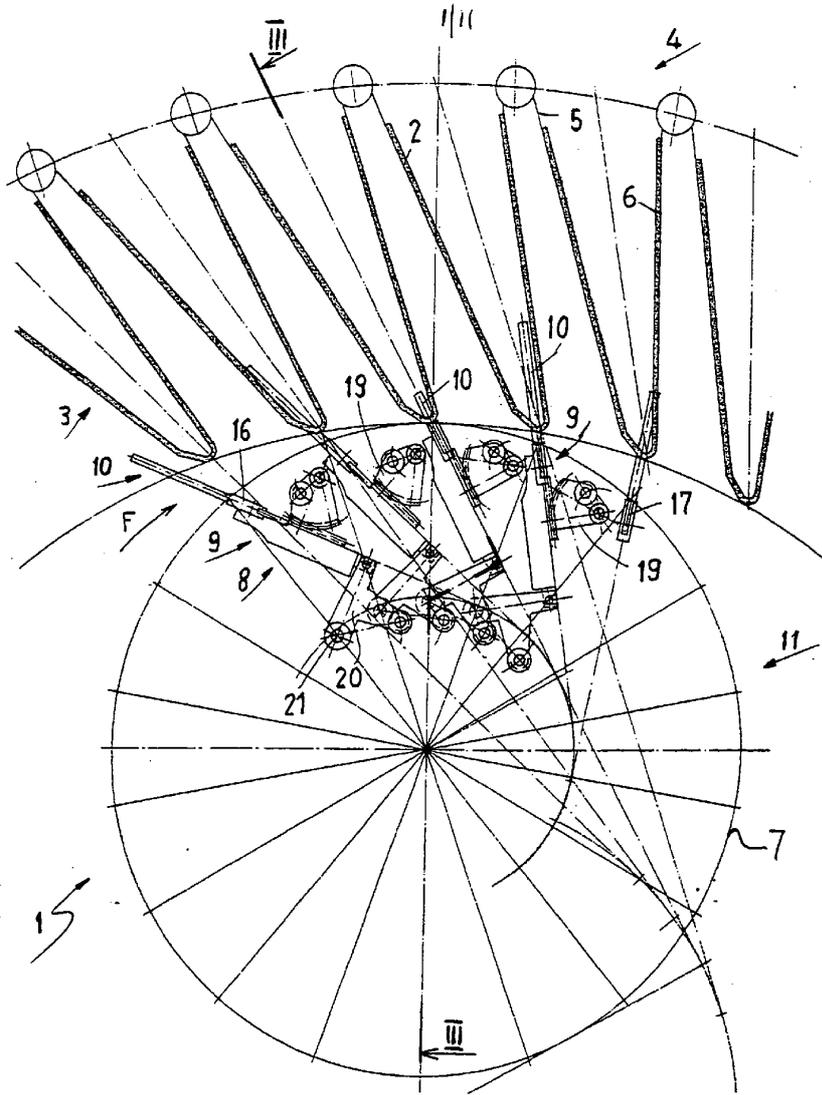


Fig. 1

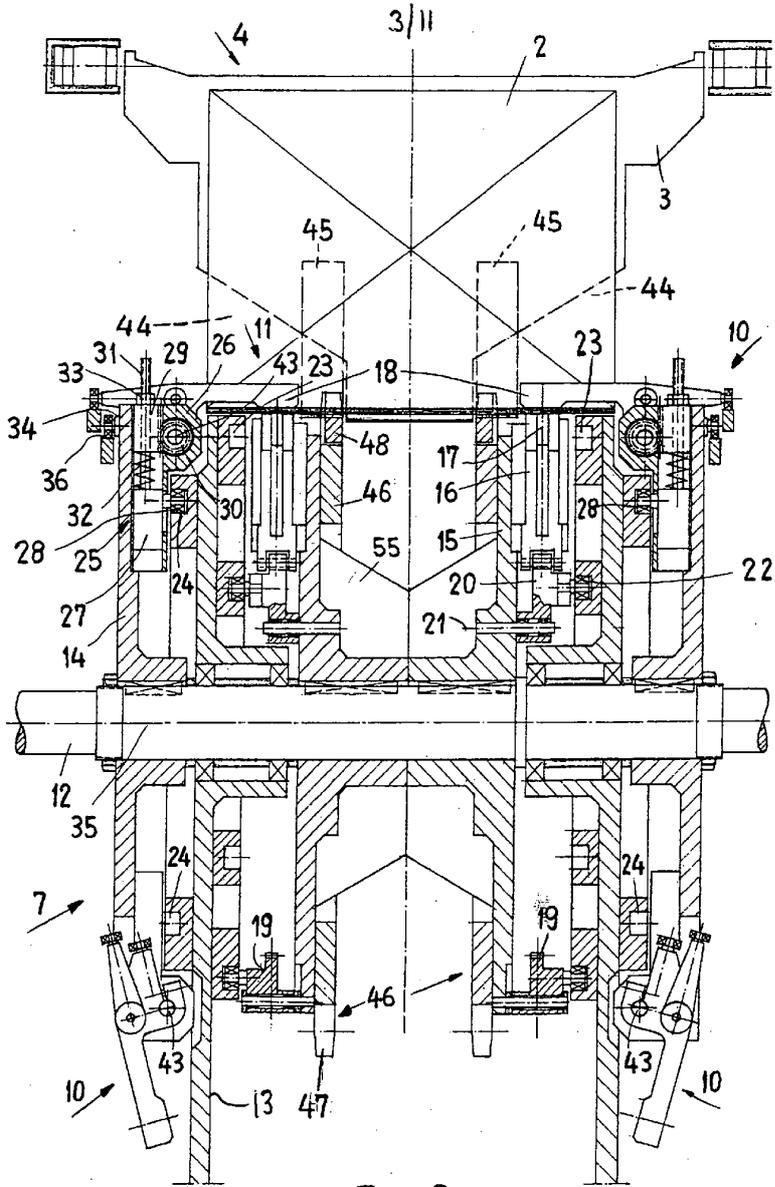


Fig. 3

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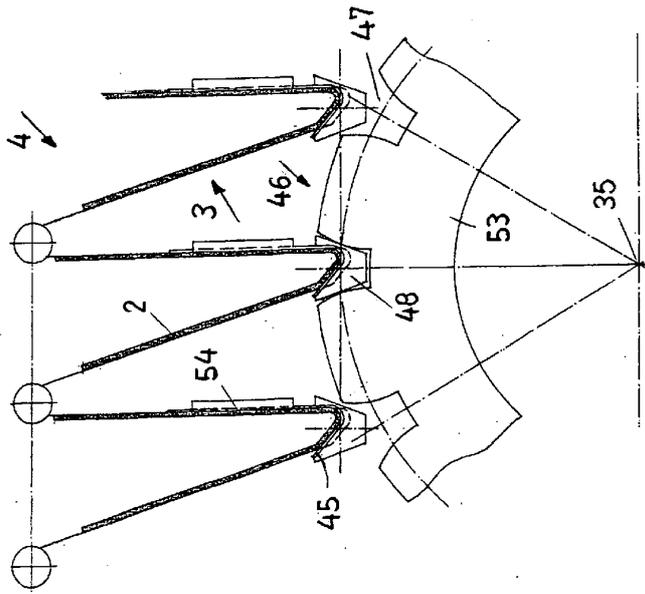


Fig. 4

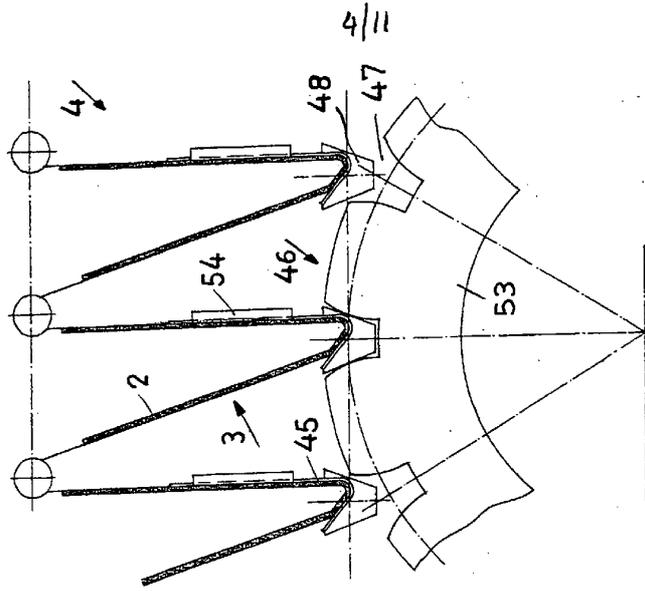


Fig. 5

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Fig. 6

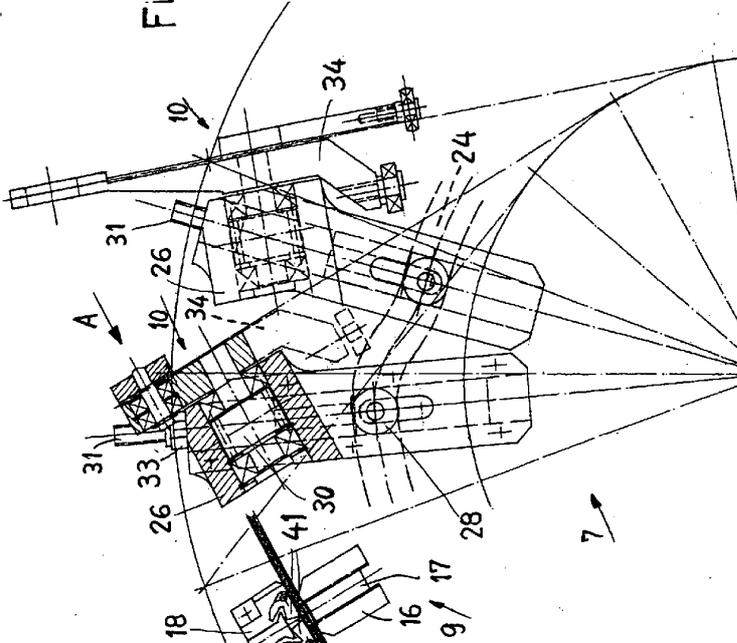
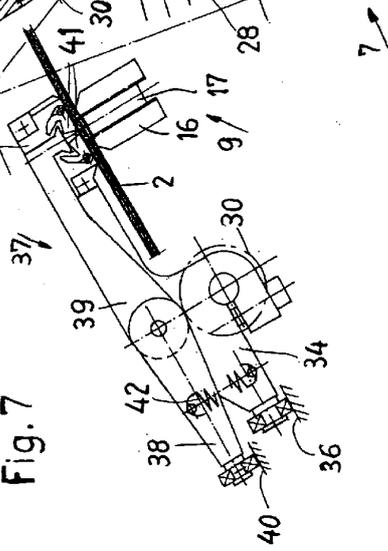


Fig. 7



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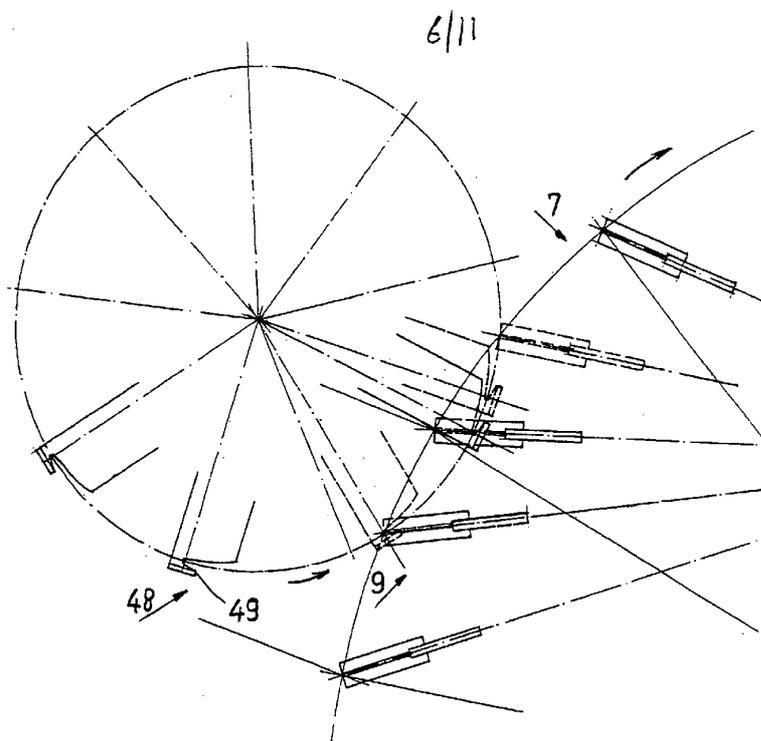


Fig. 8

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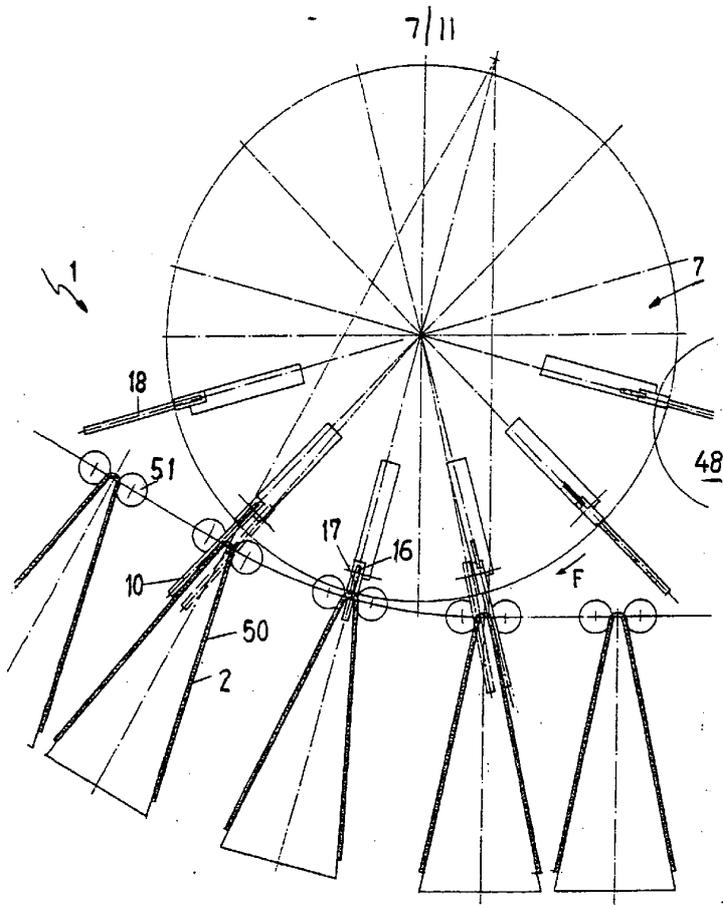
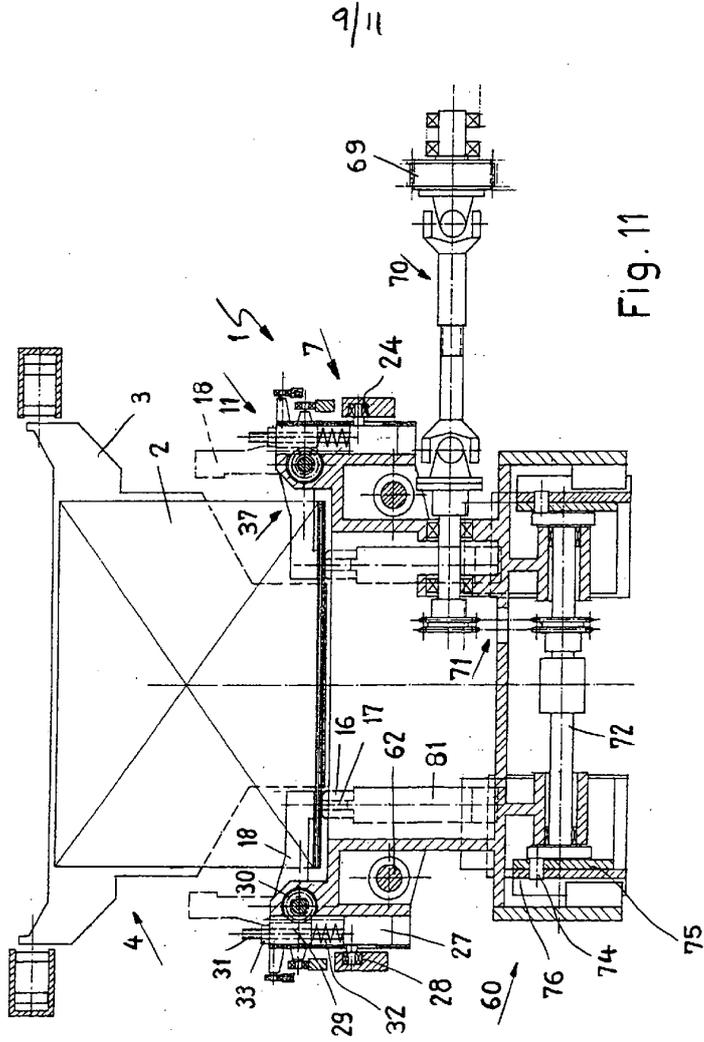


Fig. 9

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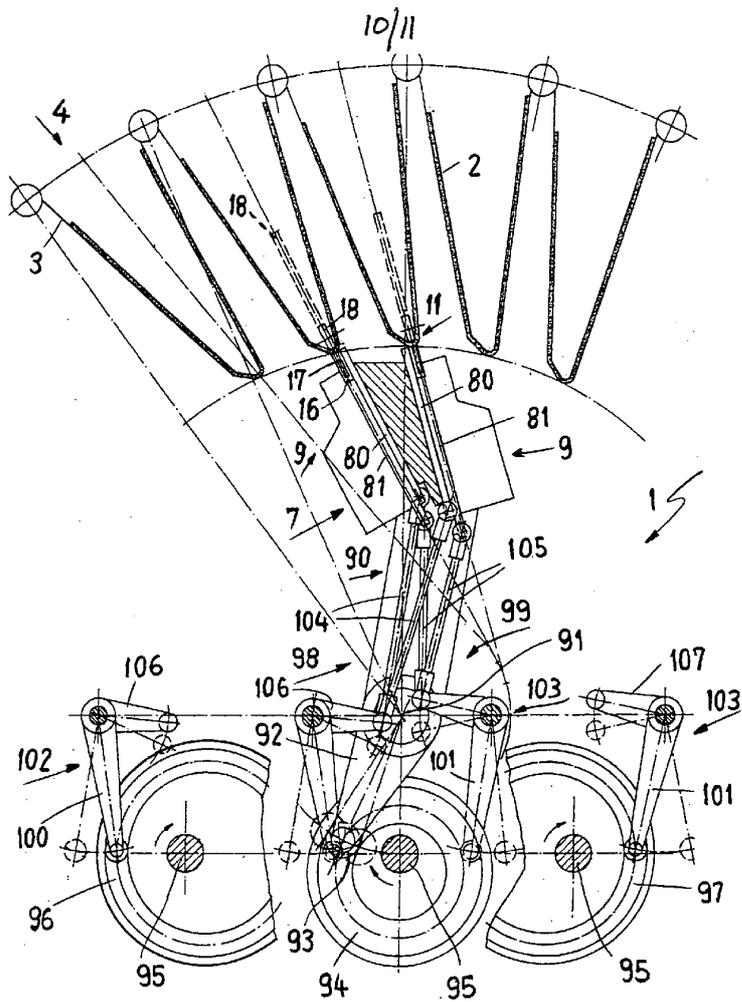


Fig. 12

FIG. 13

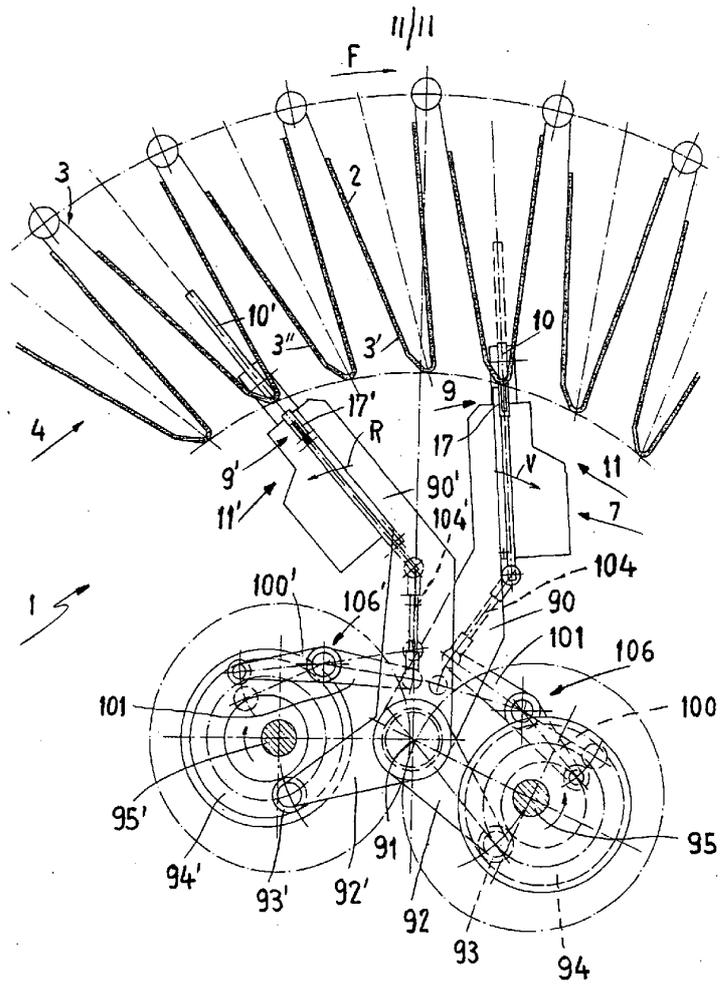


Fig. 13