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(71) Applicant: **AGFA-GEVAERT N.V.**
2640 Mortsel (BE)

(72) Inventors:
- **Verhoest,Bart,**
  c/o Agfa-Gevaert NV,IIE 3800
  2640 Mortsel (BE)
- **Joos, François,**
  c/o Agfa-Gevaert NV,IIE 3800
  2640 Mortsel (BE)
- **de Ruijter,Dirk,**
  c/o Agfa-Gevaert NV,IIE 3800
  2640 Mortsel (BE)

(54) Apparatus for the liquid processing of sheet material

(57) A housing (10) includes a drive device (20) for driving sheet material (22) along a sheet material path (18). Two first drive transfer members (24, 26) are driven by the drive device (20) at different velocities. Removable processing modules (28, 30, 32, 33, 34, 36), located within the housing (10), each includes a pair of rotatable members (42, 44, 58, 60, 74, 82) forming a nip (40) which defines part of the sheet material path (18). Second drive transfer members (54, 56) co-operate with the first drive transfer members to transfer drive from the drive device (20) to the rotatable members (42, 44, 58, 60, 74, 82) and are so positioned to co-operate with one or other of the two first drive transfer members (24, 26) according to the desired function of the processing module (28, 30, 32, 33, 34, 36). The apparatus can be used for a number of different processing applications by simple replacement of processing modules.

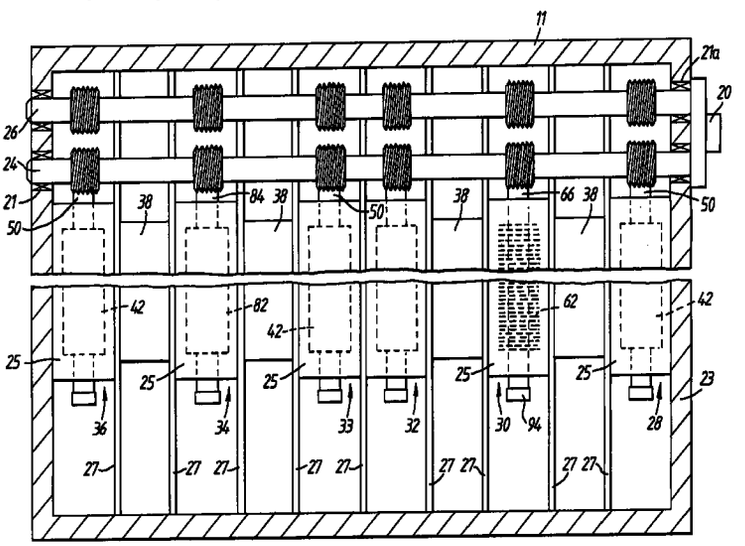

Fig.2

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Description

FIELD OF THE INVENTION

[0001] This invention relates to an apparatus for the processing of sheet material, in particular the liquid processing of photographic sheet material, such as X-ray film, pre-sensitised plates, graphic art film and paper, and offset plates. More particularly the invention relates to improvements in apparatus in which photographic material is transported through one or more treatment units.

BACKGROUND OF INVENTION

[0002] As a rule, a processing apparatus for photographic sheet material comprises several vessels each of which contains a treatment liquid, such as a developer, a fixer and a rinse liquid. As used herein, the term sheet material includes not only photographic material in the form of cut sheets, but also in the form of a web unwound from a roll. The sheet material to be processed is transported through these vessels in turn, by transport means such as one or more pairs of drive rollers, and thereafter optionally to a drying unit. The time spent by the sheet material in each vessel is determined by the transport speed and the dimensions of the vessel in the sheet feed path direction.

[0003] An apparatus for the liquid processing of sheet material is known, for example from European patent application 93200502.8 (Agfa-Gevaert NV, filed 23 February 1993) which comprises a housing and a number of removable racks located within the housing. The housing includes a drive device for driving sheet material along a sheet material path in a processing direction through the apparatus and first drive transfer means. Each rack includes a pair of rollers forming a nip therebetween which defines part of the sheet material path through the apparatus and second drive transfer means co-operating with the first drive to transfer means transfer drive from the drive device to the rollers.

[0004] Such an apparatus is constructed with removable racks for the purpose of the ease of maintenance. While racks may be replaced when necessary, any new rack must carry out the same or similar function as the replaced rack.

[0005] European patent application EP 622676 (Eastman Kodak Company) describes a processor comprising a housing having at least one modular wall structure for dividing the housing into a plurality of fluid processing chambers. A modular processing device is placed in at least one of the processing chambers for circulating a processing fluid placed in the chamber.

[0006] It is desirable to provide an apparatus which can be used for a number of different processing applications. While a removable rack construction, such as that described in European patent application 93200502.8, could be envisaged for such an apparatus, it would not be possible to use such an apparatus for processes which require the racks to perform different functions. In particular, it would not be possible to replace a rack carrying drive rollers, which in one application are intended to rotate in one direction to drive sheet material in a processing direction through the apparatus, with a rack carrying rotatable members which for another application are intended to rotate in an opposite direction.

OBJECTS OF INVENTION

[0007] It is an object of the present invention to provide an apparatus which can be used for a number of different processing applications while overcoming the aforesaid disadvantages.

SUMMARY OF THE INVENTION

[0008] We have discovered that this objective can be achieved, and other useful benefits obtained, when the first drive transfer means comprises two first drive transfer members adapted to be driven by the drive device at different velocities and the second drive transfer means comprises second drive transfer members so positioned to cooperate with one or other of the two first drive transfer members according to the desired function of the processing module.

[0009] Thus, according to the invention there is provided an apparatus for the processing of sheet material comprising:

- a housing including a drive device for driving sheet material along the sheet material path in a processing direction through the apparatus, and first drive transfer means; and
- at least one removable processing module located within the housing, the module including a rotatable member and second drive transfer means co-operating with the first drive transfer means to transfer drive from the drive device to the rotatable member,

characterised in that the first drive transfer means comprises two first drive transfer members adapted to be driven by the drive device at different velocities and the second drive transfer means comprises a second drive transfer

member so positioned to co-operate with one or other of the two first drive transfer members according to the desired function of the processing module.

[0010] The housing is preferably divided by internal partial walls into a number of compartments into which the processing modules are fitted. The housing may be in two parts, having a base portion and a removable lid. The top edge of the base portion is preferably above the static liquid level, to reduce the risk of leakage when the apparatus is idle.

The worm drives and associated drive device are best mounted in the base portion, because of the short tolerance necessary between the worm drive and the worm gears. The drive device is preferably constituted by a drive motor and associated gear box, adapted to drive the two first drive transfer members in opposite rotational directions. A DC or brush-less AC motor is suitable. The gear box associated with the drive motor may be adjustable to cause the drive transfer members to rotate in the same rotational direction, if occasionally so required. As an alternative to the use of a gear box, two drive motors can be used, for example located one at each end of the housing, together with suitable controls to enable the drive motors to cause the first drive transfer members to be driven as required.

[0011] Usually, the apparatus will define a generally horizontal sheet material path there-through. However, a vertical or inclined configuration is also possible. The sheet material path will generally be substantially straight.

[0012] The processing modules may conveniently comprise a sub-frame so shaped as the fit into compartments within the housing, the rotatable members being carried by the sub-frame. In this way the module may be removed from the housing and replaced without fear of disturbing the spacial relationship between the rotatable members.

[0013] Preferably the two first drive transfer members comprise two worm drives coupled to the drive device in such a manner as to rotate at different speeds and/or in different directions. The rotatable member may comprise a shaft, the second drive transfer member comprising a worm gear positioned on the shaft to receive drive from one or other of the worm drives.

[0014] Usually, the processing module will comprise two rotatable members, forming a nip therebetween which defines part of the sheet material path through the apparatus, each rotatable member having an associated second drive transfer means.

[0015] In one embodiment, the processing module comprises two drive rollers, the second drive members associated with the drive rollers being so positioned as to engage a first of the first drive transfer members thereby to drive sheet material along the sheet material path in the processing direction. The drive rollers may each comprise a rigid core carrying a covering of elastomeric material, the core being secured to a drive roller shaft on which a second drive transfer member is located.

[0016] It is desirable to seal the drive rollers to the sub-frame in which they are carried, thereby to define liquid-tight and gas-tight processing cells within the apparatus for containing suitable treatment liquids. Sealing of the drive rollers helps to reduce leakage of treatment liquid from one processing cell to another. The drive rollers may be sealed by the provision of fixed or rotatable sealing members. The use of sealing rollers carried in bearings secured to, or integral with, the associated sub-frame is preferred. By the use of a sealing roller in place of a stationary sealing member, the torque which needs to be applied to the path-defining roller can be significantly reduced. This reduces the power needed by the processor, reduces wear on the path-defining roller, reduces the mechanical deformation thereof and thereby extends the expected life time. This construction also improves the control of pressure distribution over the sheet material. The sealing roller may have a diameter less than that of the drive roller. For example, the sealing roller may have a diameter which is from one tenth to one third of the diameter of the drive roller, thereby enabling the torque which needs to be applied to be further reduced. The sealing roller preferably extends in a straight line parallel to the associated drive roller axis and preferably contacts the surface of the associated drive roller at a location which is between 45° and 315°, most preferably between 135° and 225° from the centre of the nip, on the fluid side.

[0017] The sealing roller may be formed of a material having a coefficient of friction (as measured against stainless steel) of less than 0.3, preferably from 0.05 to 0.2, for example highly polished metals such as steel, especially Cr-Ni steel and Cr-Ni-Mo steel, a metal coated with Ni-PTFE (NIFLOR - Trade Mark), a polymer material such as PTFE (poly tetra fluoro ethylene), POM (polyoxymethylene), HDPE (high density polyethylene), UHMPE (ultra high molecular weight polyethylene), polyurethane, PA (polyamide), PBT (polybutyl terephthalate) and mixtures and composites thereof.

[0018] The drive rollers and the sealing rollers should be mounted between end plates of the sub-frame in a leak-proof manner.

[0019] It is preferred to define intermediate cells between each pair of processing cells to avoid leakage of treatment liquid from one processing cell to another. The intermediate cells may include leakage trays so positioned that any treatment liquid which passes through the nip between the drive rollers drips into the leakage tray, for collection and recirculation as desired. Intermediate cells may provide a dead space where diffusion reactions can occur on the sheet material as it passes there-through.

[0020] In a similar manner, it is preferred to define intermediate cells at the inlet and outlet to the apparatus, to avoid

leakage of environmental air into the first and last processing cells, thus reducing the evaporation, oxidation and carbonisation thereof leading to a reduction in the consumption of treatment liquids.

[0021] The processing cells which are defined between the sealed drive roller modules may include intermediate processing modules comprising unsealed rollers which may be driven rollers, or non driven rollers for breaking the laminar fluid at the surface of the sheet material as it passes through the apparatus.

[0022] Typical drive rollers have a core provided with a covering of elastomeric material, although it is possible for a roller to be elastomeric throughout its cross-section. The elastomeric material covering preferably has a thickness of between 1 mm and 30 mm. The elastomeric material may be selected from ethylene/propylene/diene terpolymers (EPDM), silicone rubber, polyurethane, thermoplastic rubber such as Santoprene (Trade Mark for polypropylene/EPDM rubber), styrene-butyl rubber and nitrile-butyl rubber. The hardness of the elastomeric material may be between 15 Shore (a) and 90 Shore (a), as measured on the roller surface. Preferably, the core has a flexural E-modulus of between 50 GPa and 300 GPa. Suitable materials for the rigid core include metals, such as stainless steel, non-ferrous alloys, titanium, aluminium or a composite thereof. In one embodiment of the invention, the core is hollow. Alternatively the core may be solid.

[0023] The rollers may be biased together by a variety of methods. The rollers may be biased together for example by making use of the intrinsic elasticity of the elastomeric material, by the use of fixed roller bearings. Alternatively, use may be made of resilient means such as springs which act on the ends of the roller shafts. The springs may be replaced by alternative equivalent compression means, such as e.g. a pneumatic or a hydraulic cylinder.

[0024] In a further embodiment of the processing module, it comprises a rotatable sheet contacting member and a rotatable backing member, the second drive transfer member associated with the sheet contacting member being so positioned as to receive drive from a second of the first drive transfer members to drive the wiping member in a rotational direction opposed to the processing direction. The sheet contacting member may comprise a brush having fibres mounted on a core secured to a wiping member shaft, a second drive transfer member being located on the brush shaft. The sheet contacting member may alternatively comprise a sheet wiping cloth, formed of a soft material such as cotton, mounted on a core secured to a wiping member shaft, a second drive transfer member being located on the wiping member shaft. In these embodiments, the rotatable backing member may comprise a rigid roller carried on a backing member shaft, a second drive transfer member being located on the backing member shaft. Preferably, the second drive transfer member associated with the backing member is so positioned as to both receive drive from the first drive transfer member thereby to rotate the backing member in the processing direction.

[0025] Where the module carries, for example, rotating brushes and backup rollers instead of drive rollers, is it not necessary to seal these brushes and backup rollers to the sub-frame, when processing modules including sealing means are positioned both upstream and downstream of the brush carrying module.

[0026] The construction of the apparatus enables the easy modification of the apparatus according to the function which it is desired to perform. Thus, the invention also provides a method of modifying a sheet material processing apparatus to perform a different processing function. The apparatus essentially comprises a housing including a drive device for driving sheet material along a sheet material path in a processing direction through the apparatus, and two first drive transfer members adapted to be driven by the drive device at different velocities; and at least one removable processing module located within the housing, the module including a pair of rotatable members forming a nip therebetween which defines part of the sheet material path through the apparatus, and a second drive transfer member so positioned to receive drive from one of the two first drive transfer members to transfer drive from the drive device to the rotatable members. The method of modifying the apparatus comprises removing the processing module from the housing by disengaging the second drive transfer member from the first drive transfer member and replacing removed processing module with another processing module having a second drive transfer member so positioned to receive drive from the other of the first drive transfer members.

[0027] This flexibility of use is particularly advantageous where the apparatus is coupled to an imaging device which is able to output imaged photographic sheet materials of various different forms. In particular, the apparatus according to the invention is advantageously coupled to a laser recorder capable of exposing a wide range of sheet materials.

[0028] A latch mechanism may be provided to hold each processing module in place in the housing. For example, the latch mechanism includes a spring loaded handle which is pivoted onto the base of the housing. Rotation of the handle releases the latch. The end of the processing module rests on a spring carried on the housing base. This spring acts in the upwards direction to help lift the module out of the housing when the latch is released. When a new module is inserted, the handle is pushed out of the way and then snaps back into the latching position.

[0029] The housing may additionally comprise the necessary pipe-work, pumps, filters, heating and cooling units and the like to supply treatment liquid as desired to the processing cells of the apparatus.

[0030] A typical processing cell width would be 400 mm, with a sheet material path from inlet to outlet of 1000 mm, of which 50 mm is accounted for by each processing module.

DETAILED DESCRIPTION OF THE INVENTION

[0031] The invention will be described by the following illustrative embodiments with reference to the accompanying drawings without the intention to limit the invention thereto, and in which:

Figure 1 is a schematic representation of an apparatus according to the invention, shown in longitudinal cross-section;

Figure 2 is a partly cut-away view from above of the apparatus shown in Figure 1, with the lid of the housing removed;

Figure 3 shows a cross-section of one end of one processing module in the apparatus shown in Figure 1;

Figure 4 shows a cross-section of one end of another processing module in the apparatus shown in Figure 1;

Figure 5 shows a cross-section of one end of a further processing module in the apparatus shown in Figure 1;

Figure 6 is a view similar to that of Figure 4, showing the replacement of the processing module in the apparatus;

Figure 7 is a partial cross-section of the processing module shown in Figure 4, showing the module latching mechanism; and

Figure 8 is a perspective view of an alternative embodiment of the present invention, with some features removed.

[0032] The drawings show an apparatus for the liquid processing of sheet material. The apparatus comprises a two-part housing 10 having a base portion 11 and removable lid 12. The housing includes an inlet opening 14 and an outlet opening 16 defining a substantially horizontal and substantially straight sheet material path 18 through the apparatus. A DC drive motor 20 is provided, preferably at the same end of the housing as the inlet opening 14, to drive sheet material 22 along the sheet material path 18 in a processing direction indicated by the arrow A.
In a manner known per se, means are provided to establish a static liquid level S in the apparatus when the drive motor 20 is not operating. The top edge 23 of the base portion 11 is above the static liquid level S.

[0033] The housing 10 includes first and second worm drives 24, 26 mounted in bearings 21, 21a, such as double ball bearings, and coupled to the drive motor 20 via a gear box in such a manner that the worm drives can be caused to rotate in different directions. The worm drives 24, 26 and the associated drive motor 20 are mounted in the base portion 11. The gear box associated with the drive motor 20 can be adjusted to cause the worm drives 24, 26 to rotate in the same direction, if occasionally so required.

[0034] The housing 10 is divided by internal partial walls 27 into a number of compartments into which a number of removable processing modules 28, 30, 32, 33, 34, 36 are fitted. Guide plates 38 are positioned between the internal partial walls 27 to guide the sheet material from one processing module to the next. The modules 28, 30, 32, 33, 34, 36 each include a sub-frame 25 which supports a pair of rotatable members of varying description which form a nip 40 therebetween which defines part of the sheet material path 18 extending from the inlet opening 14 to the outlet opening 16 through the apparatus.

[0035] As shown in Figure 3, the processing module 28 comprises upper and lower drive rollers 42, 44 and associated upper and lower sealing rollers 43, 45, which seal the drive rollers to the sub-frame 25. The drive rollers 42, 44 each comprise a rigid core 46 carrying a covering 48 of elastomeric material, the core 46 being secured to upper and lower drive roller shafts 50, 52. The upper drive roller shaft 50 fixedly carries a worm gear 54, which meshes with the first worm drive 24, and an upper spur gear 55. It is preferred to use the nearer worm drive 24, rather than the further worm drive 26, for driving the sheet material through the apparatus to reduce any variation in drive speed which might result from the flexibility of the drive roller shaft 50.

[0036] The lower drive roller shaft 52 fixedly carries a lower spur gear 57, which meshes with the upper spur gear 55. The worm gear 54, carried on and fixed to the upper drive roller shaft 50, is so positioned as to engage the first worm drive 24 thereby to drive the upper drive roller 42 in the indicated direction. The upper spur gear 55 is coupled to the lower spur gear 57 carried on and fixed to the lower drive roller shaft 52, so that the lower drive roller 44 is driven in the indicated direction. As a result, the sheet material 22 is driven along the sheet material path 18 in the processing direction. The processing modules 32, 33 and 36 are similar.

[0037] Referring to Figure 4, the processing module 30 comprises a rotatable sheet wiping member in the form of a brush 58 and a rotatable backing member in the form of a rigid backing roller 60. The brush 58 has fibres 62 mounted on a brush core 64 secured to a brush shaft 66. A worm gear 68 is located on and fixed to the brush shaft 66, and is so

positioned as to engage the second worm drive 26 to drive the brush 58 in a rotational direction opposed to the processing direction. The rigid backing roller 60 is carried on a backing roller shaft 70, which carries and is fixed to a lower spur gear worm gear 72, meshing with a combined worm/spur gear 73 freely mounted on the brush shaft 66, and engaged by the worm drive 24. The worm drive 24 thereby drives the backing roller 60 in the processing direction.

[0038] Referring to Figure 5, in module 34, a sheet wiping member 74 comprises a sheet wiping cloth 76 of softer material, such as cotton, which wipes over the surface of the sheet material 22 as it passes. The sheet wiping cloth 76 is mounted on a core 78 secured to a wiping member shaft 80. A backing member is provided in the form of a rigid backing roller 82 carried on a backing roller shaft 84. A worm gear 88 is fixed on the backing roller shaft 84 and is so positioned as to engage the worm drive 24 thereby to rotate the backing roller 82 in the processing direction. A spur gear 86 is located on and fixed to the wiping member shaft 80, and meshes with a combined worm/spur gear 87 which is freely mounted on the backing member shaft 84, and is engaged by the worm drive 26. The worm drive 24 thereby drives the wiping member 74 in a rotational direction opposed to the processing direction.

[0039] In the modules shown in Figures 4 and 5, it not necessary to seal the brush 58, the wiping member 74 and backup rollers 60, 82 to the sub-frame, when processing modules including sealing means, such as modules 28, 32, 33 and 36, are positioned both upstream and downstream of the brush carrying module.

[0040] Thus it will be seen that each of the processing modules 28, 30, 32, 33, 34 and 36 includes rotatable members each carried on a shaft on which worm gears are located. The worm gears are so positioned to co-operate with one or other of the two worm drives 24, 26 to transfer drive from the drive motor 20 to the rotatable members according to the desired function of the respective processing module.

[0041] As illustrated in Figures 6 and 7, one end 96 of the sub-frame 25 which is adjacent the worm drives, carries a hook 90 located in a slot 91 in the base 11 of the housing 10 and resists the torque on the module when the motor 20 is running. The other end 98 of the processing module rests on a spring-loaded support 100 carried on the housing base 11. A latch mechanism 92 holds the processing modules in place in the housing 10. The latch mechanism 92 includes a spring loaded catch 93 which is pivoted onto the base 11 of the housing and which engages a hook 95 carried on the other end 98 of the module. Rotation of an operating handle 94 releases the latch. The spring-loaded support 100 is biased in the upwards direction to help lift the module 30 out of the housing when the latch mechanism is released. When a new module is inserted, the handle 94 is pushed out of the way and then snaps back into the latching position.

[0042] When modules are replaced in the apparatus, it will be usual to first drain the processing liquid(s) therefrom.

[0043] It will also be seen that the apparatus shown in Figures 1 to 7 comprises two adjacent processing cells, as defined by those processing modules 28, 32, 33 and 36 which include sealed drive rollers. This is merely illustrative. In practice more processing cells would be so defined.

[0044] In a practical example of a processing apparatus according to the invention, twelve processing modules may be provided, as indicated in the following Table. The application to which such an apparatus may be put can be varied by replacing certain ones of the processing modules.

[0045] The table illustrates three such applications, A, B and C. These are for example:

APPLICATION A:

[0046] For the processing of aluminium printing plates, e.g. the "LITHOSTAR" (Trade Mark) silver salt diffusion process, such as is described in United States patent US 5449585 (assigned to Agfa-Gevaert NV). The cells defined by the processing modules contain:

1/2:	air
2/3/4/5:	high pH developer
5/6:	air (for diffusion)
6/7/8:	wash off
8/9:	air
9/10/11:	rinse finish cascade
11/12:	air

APPLICATION B:

[0047] For the processing of "Rapid Access" (Trade Mark) high contrast film such as is described in European patent specifications EP 196705 and EP 239149 (both Agfa-Gevaert NV).

[0048] The cells defined by the processing modules contain:

1/2:	air

2/3/4/5: developer
5/6: air
6/7/8: fixer cascade
8/9: air
9/10/11: rinse cascade
11/12: air

APPLICATION C:

[0049] For the processing of laser image heat-sensitive aluminium-based printing plates, e.g. the "THERMOSTAR" (Trade Mark) process, such as described in European patent application EPA 97201560.6 filed 27 May 1997 (Agfa-Gevaert NV).

[0050] The cells defined by the processing modules contain:

1/2: air
2/3/4/5: agitated developer
5/6: air (for diffusion)
6/7/8: wash off
8/9: air
9/10/11: non-cascade gumming
11/12: air

APPLICATION:	A	B	C
Module No.1	sealed drive rollers	sealed drive rollers	sealed drive rollers
2	sealed drive rollers	sealed drive rollers	sealed drive rollers
3	unsealed drive rollers	unsealed drive rollers	brush
4	unsealed drive rollers	unsealed drive rollers	brush
5	sealed drive rollers	sealed drive rollers	sealed drive rollers
6	sealed drive rollers	sealed drive rollers	sealed drive rollers
7	brush	sealed drive rollers	brush
8	sealed drive rollers	sealed drive rollers	sealed drive rollers
9	sealed drive rollers	sealed drive rollers	sealed drive rollers
10	sealed drive rollers	sealed drive rollers	unsealed drive rollers
11	sealed drive rollers	sealed drive rollers	sealed drive rollers
12	sealed drive rollers	sealed drive rollers	sealed drive rollers

[0051] The housing of such an apparatus is shown in Figure 8 in which the levers 94 are removed for the sake of clarity. The apparatus comprises a two-part housing 110 having a base portion 111 and removable lid 112 hinged thereto. The housing includes an inlet opening 114 and an outlet opening 116 defining a substantially horizontal sheet material path through the apparatus. The top edge 123 of the base portion 111 is above the static liquid level in the apparatus. The housing 110 is divided by internal partial walls 127 into a number of compartments into which a number of removable processing modules are fitted. The internal partial walls 127 include cut outs 128 for accommodating worm drives not shown, and sub-housings 129 into which bearings for the worm drives are mounted.

Claims

1. An apparatus for the processing of sheet material comprising:

   - a housing (10) including a drive device (20) for driving sheet material (22) along a sheet material path (18) in a processing direction through the apparatus, and first drive transfer means; and

- at least one removable processing module (28, 30, 32, 33, 34, 36) located within said housing (10), said module (28, 30, 32, 33, 34, 36) including a rotatable member (42, 44, 58, 60, 74, 82) and second drive transfer means co-operating with said first drive transfer means to transfer drive from said drive device (20) to said rotatable member (42, 44, 58, 60, 74, 82), characterised in that said first drive transfer means comprises two first drive transfer members (24, 26) adapted to be driven by said drive device (20) at different velocities and said second drive transfer means comprises a second drive transfer member (54; 68, 73; 87, 88) so positioned to co-operate with one or other of said two first drive transfer members (24, 26) according to the desired function of said processing module (28, 30, 32, 33, 34, 36).

2. An apparatus according to claim 1, wherein said two first drive transfer members comprise two worm drives (24, 26) coupled to said drive device (20) in such a manner as to rotate at different speeds and/or in different directions.

3. An apparatus according to claim 2, wherein said rotatable member (42, 44, 58, 60, 74, 82) comprises a shaft (50, 52, 66, 80, 70, 84), said second drive transfer members comprising a gear (54, 57; 68, 72; 87, 86) positioned on said shaft (50, 52, 66, 70, 84, 80) to receive drive from one or other of said worm drives (24, 26).

4. An apparatus according to any preceding claim, wherein said processing module (28, 32, 33, 36) comprises two drive rollers (42, 44), forming a nip (40) therebetween which defines part of said sheet material path (18) through the apparatus, the second drive members (54, 57) associated with said drive rollers (42, 44) being so positioned as to receive drive from the same first drive transfer member (24) thereby to drive sheet material (22) along said sheet material path (18) in said processing direction.

5. An apparatus according to claim 4, wherein a further said processing module (30, 34) comprises a rotatable sheet contacting member (58, 74) and a rotatable backing member (60, 82), the second drive transfer member (68, 86) associated with said sheet contacting member (58, 74) being so positioned as to receive drive from a second of said first drive transfer members (26) to drive said contacting member (58, 74) in a rotational direction opposed to said processing direction.

6. An apparatus according to claim 5, wherein said sheet contacting member comprises a sheet wiping member (74) having a sheet wiping cloth (76) mounted on a core (78) secured to a wiping member shaft (80), a second drive transfer member (86) being located on said wiping member shaft (80).

7. An apparatus according to claim 6, wherein said backing member comprises a rigid roller (60, 82) carried on a backing member shaft (70, 84), a second drive transfer member (72, 88) being located on said backing member shaft (70, 84).

8. An apparatus according to claim 7, wherein said second drive transfer member (72, 88) associated with said backing member (60, 82) is so positioned as to both receive drive from a said first said first drive transfer member (26) thereby to rotate said backing member (60, 82) in said processing direction.

9. In an apparatus for the processing of sheet material comprising:

- a housing (10) including a drive device (20) for driving sheet material (22) along a sheet material path (18) in a processing direction through the apparatus, and two first drive transfer members (24, 26) adapted to be driven by said drive device (20) at different velocities; and

- at least one removable processing module (28, 30, 32, 33, 34, 36) located within said housing (10), said module (28, 30, 32, 33, 34, 36) including a rotatable member (42, 44, 58, 60, 74, 82) and a second drive transfer member (54; 68, 73; 87, 88) so positioned to receive drive from one of said two first drive transfer members (24, 26) to transfer drive from said drive device (20) to said rotatable member (42, 44, 58, 60, 74, 82),
a method of modifying the apparatus to perform a different processing function, comprising removing said processing module (28, 30, 32, 33, 34, 36) from said housing (10) by disengaging said second drive transfer member (54; 68, 73; 87, 88) from said first drive transfer member (24, 26) and replacing the removed processing module with another processing module (28, 30, 32, 33, 34, 36) having a second drive transfer member (54; 68, 73; 87, 88) so positioned to receive drive from the other of said first drive transfer members (24, 26).

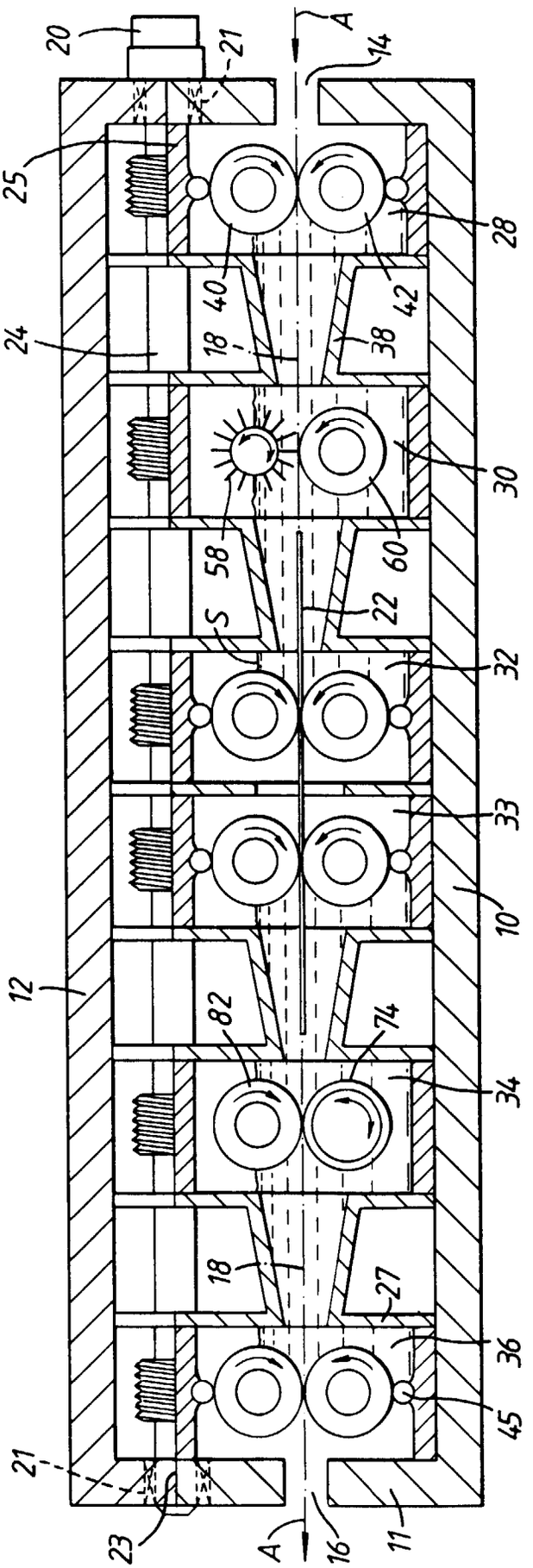
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Fig.1

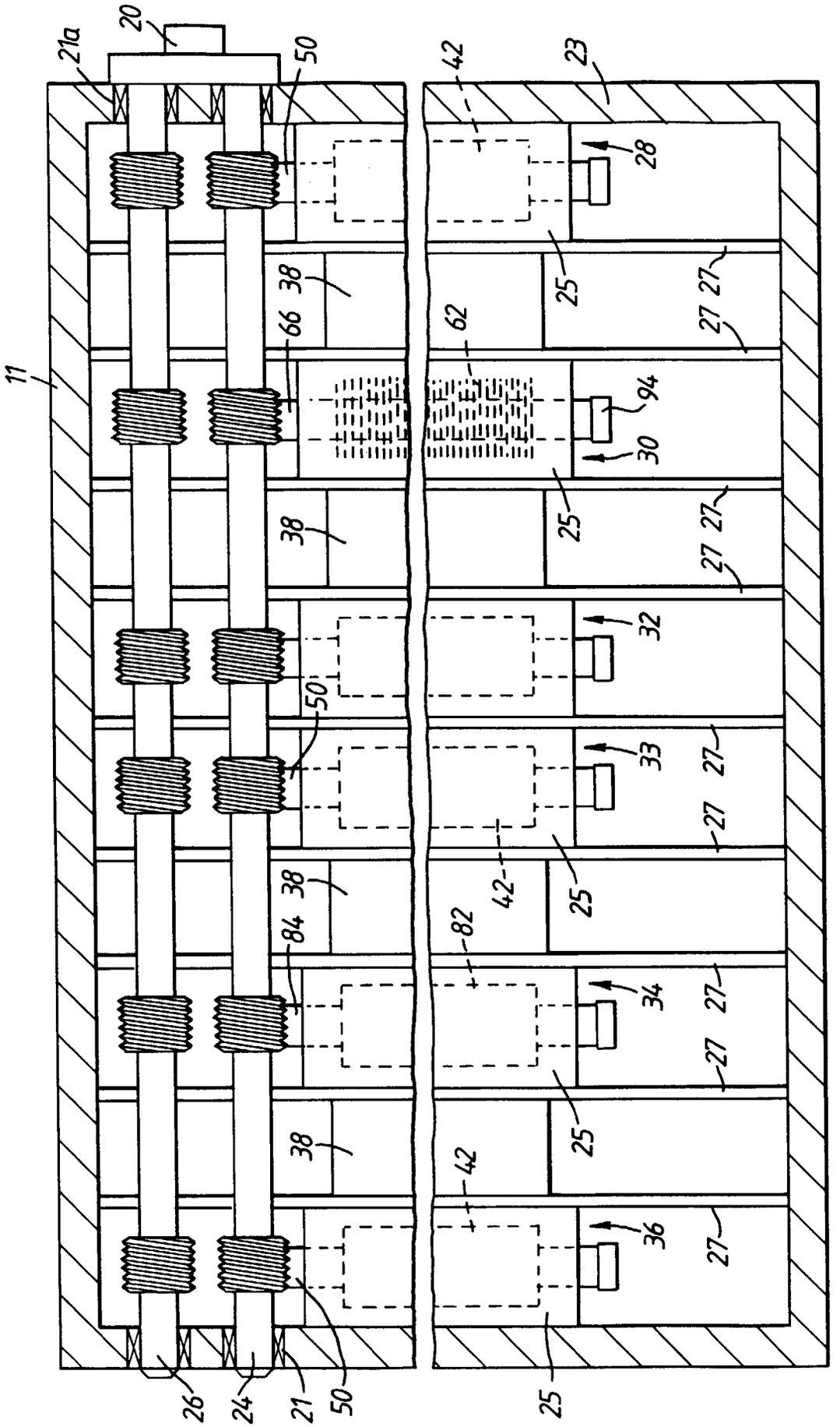

Fig.2

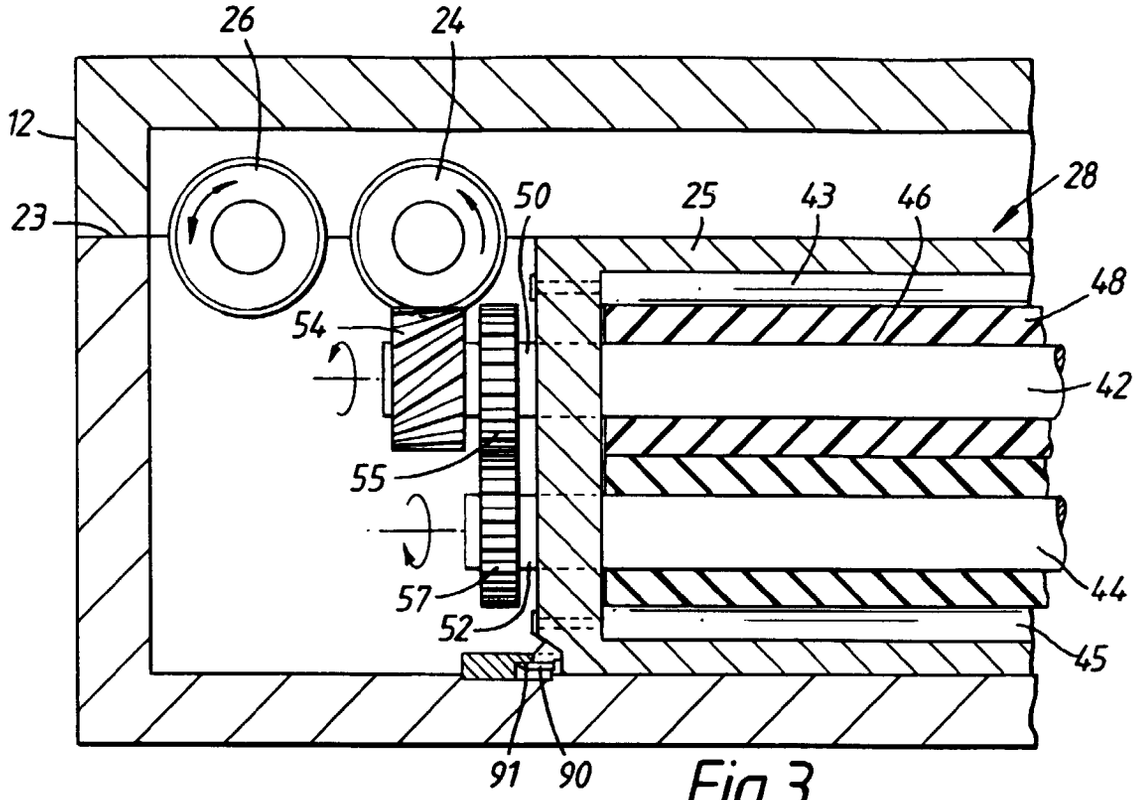
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Fig.3

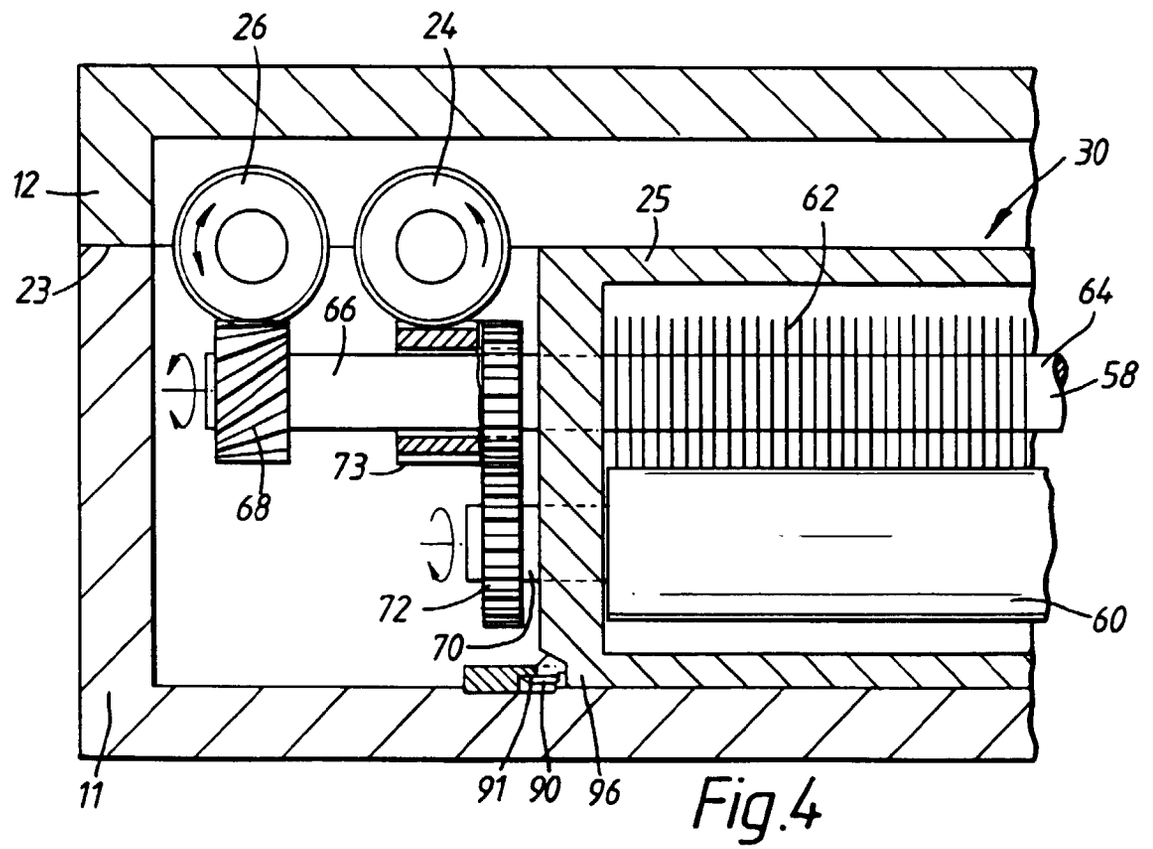
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Fig.4

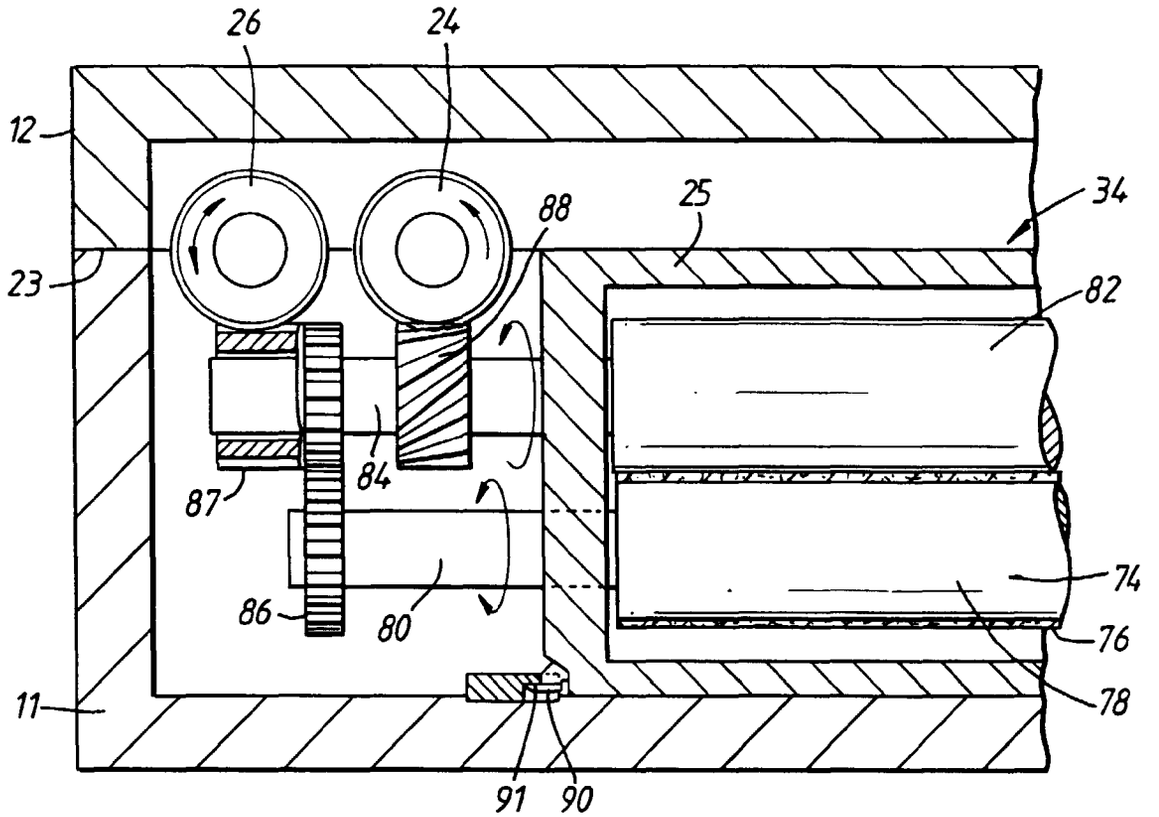

Fig 5

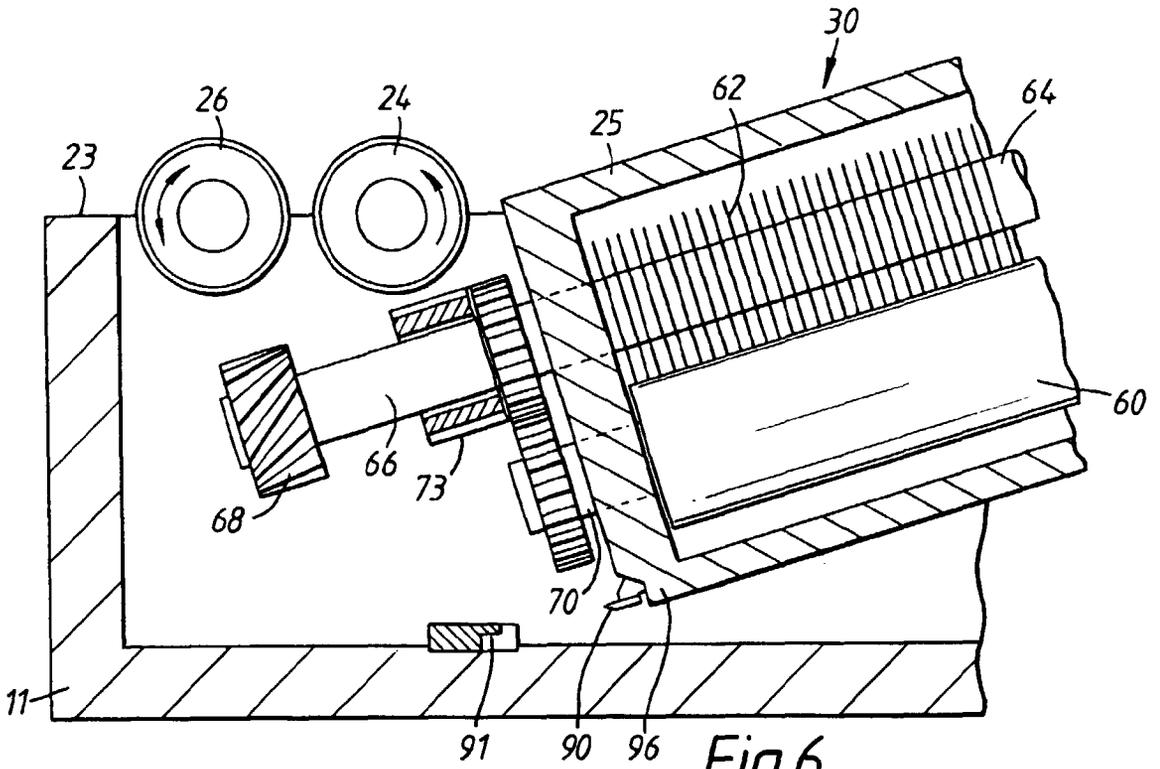
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Fig.6

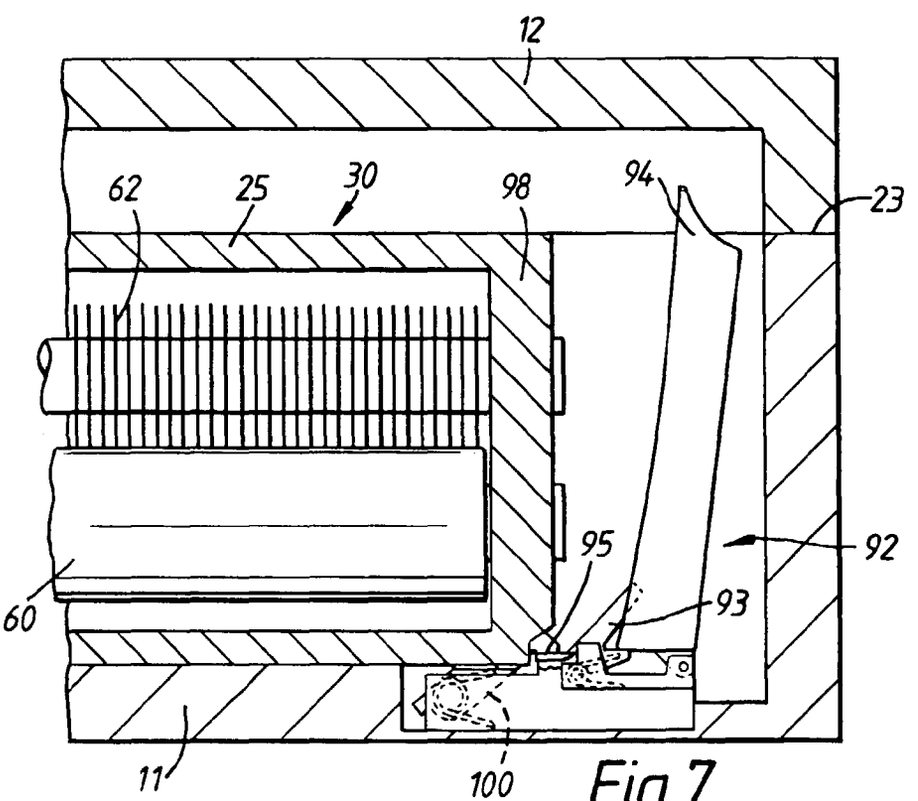
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Fig.7

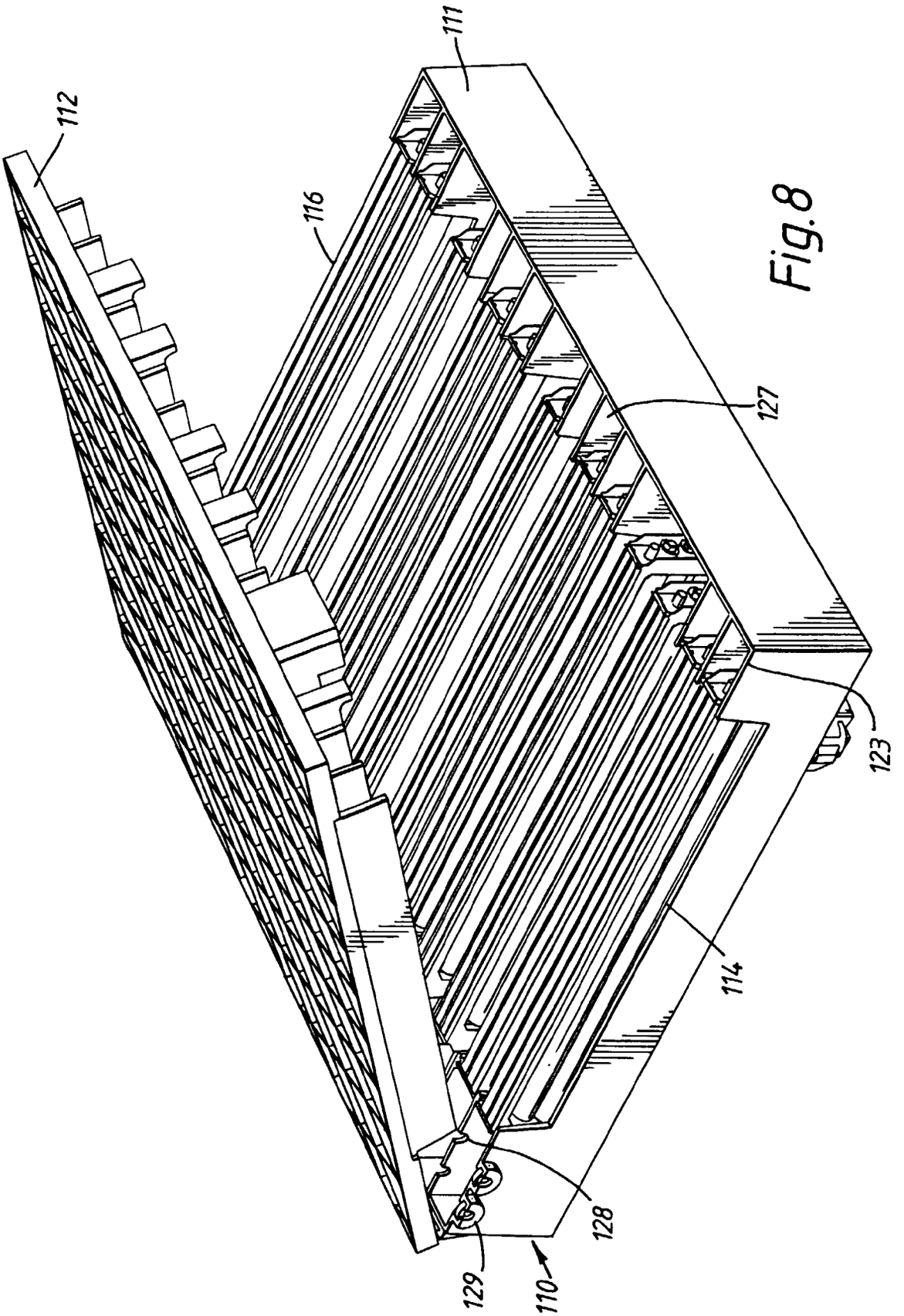

Fig.8

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EUROPEAN SEARCH REPORT

Application Number
EP 98 20 0282

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G03D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	6 July 1998	Romeo, V

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