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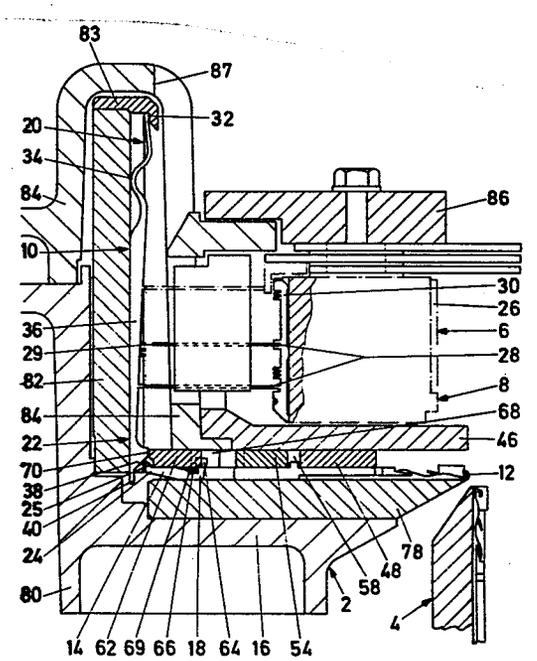
(54) Dial needle selecting mechanism.

(57) A dial selecting mechanism has a patterning means (16) associated with a dial cam system (8) for moving relative to selectors (10), jacks (14) and dial needles (12). The selectors (10) are arranged substantially at right angles to dial needles (12) to selectively engage the jacks (14) which can pivot. The selectors (10) can be biased to spring radially outwards at their lower end (22) selectively under control of the patterning means (6) to engage and pivot a selecting end (24) of the jack (14) so as to project its operating butt (18) into a cam track (14) so as to project its operating butt (18) into a cam track (64) to cause the needle (12) to be operated as desired.



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TITLE:

Dial Needle Selecting Mechanism

DESCRIPTION:

Field of invention

The invention relates to dial needle selecting mechanisms and to dial and cylinder knitting machines incorporating such mechanisms. The dial and cylinder may revolve with respect to a cam system and yarn feed station or the dial and cylinder may be fixed, the cam system and yarn feed stations revolving.

Background of invention

Dial needle selecting mechanism are described in GB Patent Specifications 305604; 481016; 473181; 1247676 and 1404811. Many of these mechanism are complicated. The GB Patent Specification 2099463 describes a simplified mechanism in which pattern drum operated slides have camming edges for lowering selectors. The selectors overcome spring bias in jacks lying in radial dial tricks to depress their operating butts

into the tricks.

It is amongst the objects of the invention to provide a dial needle selecting mechanism which is safe in use, has a wide pattern range and is of relatively simple construction.

Summary of Invention

The invention provides firstly a dial needle selection mechanism having a pattern means associated with a dial cam system, selectors controllable by the patterning means individually associated with and arranged transversely to dial needles, jacks in dial needle tricks operable by the selectors to selectively project jack operating butts so as to cause a dial needle to perform its appropriate function,

in which each of the selectors is held non-slidably at an end remote from the dial cam system for selective spring biased projection at an end close to the dial cam system to engage and pivot a selecting end of an associated rocking jack to project the jack operating butt.

By using the springing of the selectors to effect projection of the operating butt of a rocking jack reliable selection can be made

Rocking jacks can be short. Thus it becomes possible, with the invention, to position the lower selector ends radially inwards and to space the dial needle and jack operating butts well apart to permit separate cam tracks to be provided for each. The use of cam portions in which the paths of the dial needle butts and jack operating butts overlap can be avoided as can the use of pointed cams to segregate them. There is no tendency for the selectors to buckle as they are not subject to a longitudinal force. The mechanism of the invention can hence be designed to function more safely and to cope with mis-selection. Damage due to accidental breakage of butts can be reduced.

Suitably the patterning means include a drum and slides operable by the drum to engage a pattern butt on each of the selectors to selectively hold the selectors radially inward against spring bias. The use of the spring biased selectors makes it possible for the selectors to provide the pressure for sensing of the hole, pin or butt lay-out of the pattern drum, without having to use individual return springs for each slide. The slides may be replaced by pivoted members having equivalent effect.

As the selectors do not slide in a direction normal to the dial needle tricks, unlike the arrangement in most prior art constructions, the pattern butt levels can be arranged adjacent each other without having to provide for the slides to pass between pattern butts to cam them up or down. The compact pattern butt arrangement enables a large number of pattern butts to be used so that the pattern repeat area from the use of the dial needle selecting mechanism is similar to that of a cylinder needle selecting mechanism.

Preferably a resiliently deformable selector part is provided between the end remote from the dial cam system and the levels occupied by the pattern butts for spring biased projection at the end close to the dial cam system. A simple selector construction can provide individual spring bias for each lower selector end.

Conveniently each selector has a sloped part at the end close to the dial cam system for engaging the selecting end of the associated jack and the selecting end has a butt for resisting radially outward movement of the jack when the selecting end butt is projected and the operating end butt is retracted in the dial needle trick, and the selecting end butt has a sloped part on its radially outward side for facilitating the camming of that butt into the dial needle trick. The

selector and rocking jack can thus interact to transform the radial selector end movement smoothly and positively into a projecting movement of the jack operating butt.

The dial cam system can be constructed in a simple manner using cam members in the form of aligned cam plates in a circular array. Tracks for needle operating butts and jack operating butts can be defined between the plates and cam faces for inward jack ends and lower ends of the selectors can be provided at their radially inward faces, avoiding the use of separate cam members for acting on the selectors only.

Preferably the dial cam system has generally circularly arranged cam faces for holding the selectors radially inwards against spring bias and parts at which such cam faces are discontinued such as a recess to permit selectors not restrained by the patterning means to pivot associated rocking jacks. The recess, after permitting radially outward movement of appropriate selectors, can be shaped also to cam back any selectors which have moved. The pattern means then only need to hold the selectors radially inwards in a passive manner and does not have to move the selectors actively at any stage. To improve selection safety, conveniently a portion of the circularly arranged part upstream of the recess provides an overhang for the operating butt

to resist its premature projection and a portion of the circularly arranged part downstream of the recess provides an overhang for the operating butt to resist its belated projection. The overhang over the jack operating butts prior to selection for all jacks and after selection for non-projected butts only, ensures that the operating butts cannot accidentally project or catch a cam edge. Advantageously a jack control cam face is provided below a face for holding selectors radially inwards and said face is sloped or stepped at the position of the recess to pivot the jack when the associated selector acts on it under spring bias.

Said sloped or stepped face can interact with the aforementioned sloped selecting butt part to provide a smooth pivoting action for the jack.

Preferably the dial cam system provides an open track for projected operating butts which is separate from a cam track and camming zone for needle operating butts and adjacent the jack cam track there is arranged a camming projection passing through slots in the trick walls to cause the operating butts to be retracted without a pressing cam operating on those butts after the jacks have been returned radially inwards by the jack cam track. Suitably a camming means is provided upstream of the camming projection to cause all non-selected rocking

jacks to be rocked prior to selection.

Preferably the rocking jacks are of a comminutable material so that on butt breakage the broken-off butts are disintegrated between relatively moving parts of the dial. The material may be plastic.

Damage due to butt breakage and accumulation can be avoided even though the needle bed is arranged generally horizontally and narrow jack camming tracks are used.

As an alternative to the mechanically operating pattern drum, electromagnetically operated selecting mechanisms can be used. This may require changes in the selector arrangement. This has advantageously a reduced number of pattern butt heights and uses a sliding or unsprung rocking action for the selector, each however still culminating in a camming or lowering action on the inwardly located rocking jack end. The selector return action may be achieved by cams. In any event, the dial cam arrangement would be maintained to take advantage of its compactness and reduced risk of individual butt breakage and the avoidance of cumulative butt breakage resulting therefrom.

Secondly therefor the invention provides a dial needle selecting mechanism having a patterning means associated

with and arranged transversely to dial needles, jacks in dial needle tricks operable by the selectors to selectively project jack operating butts so as to cause a dial needle to perform its appropriate function, characterised in that the selectors have an end close to the dial cam system to engage and pivot a selecting end of an associated rocking jack to project the jack operating butts into an open track separate from a needle butt cam track.

DRAWINGS:

Figure 1 is a section through a dial needle selecting mechanism of the invention along line I-I of Figure 4;

Figure 2 is a section through the dial needle selecting mechanism along line II-II of Figure 4, the needle being not selected;

Figure 3 is a section through the dial needle selecting mechanism along line III-III of Figure 4, the needle being selected; and

Figure 4 is a view from above of the dial needle selecting mechanism of Figures 1 to 3.

Description of preferred embodiment

Part of a circular knitting machine is shown in Figure 1. The machine has a dial 2 and a cylinder 4. In this case the dial and cylinder are stationary and yarn feeders revolve together with the yarn supply (not shown) around the dial and cylinder. The dial 2 includes a fixed dial needle bed 78 with dial needle tricks 16 supported on a main dial casting 80. This supports a fixed, tricked cylindrical selector ring 82 and a revolvable main dial cam supporting casting 84 upon which are mounted a support 86 for patterning means 6 and a dial cam plate 46 mounting a dial cam system 8.

The main dial cam supporting casting 84 has a recess 87 to permit selectors 10 to be clipped in with a nose 32

restrained by an annular retainer ring 83. The selectors 10 extend downwards and lie close to jacks 14 in dial needle tricks 16 radially inwards of dial needles 12. The jack 14 has an operating butt 18 and a jack selecting butt 24. The selector nose 32 is at the end 20 remote from the dial needle tricks 16 and the jack selecting butt 24 is at the selector end 22 close to the tricks 16. The butt 24 has a slope 25 on one side.

The patterning means 6 includes a rotatable drum 26 with pattern bits 30 for controlling thin slides 28 not controlled by tension springs having a level, radially inward edge 29. The selectors 10 have a curved part 34 just below the nose 32 but above the level occupied by pattern butts 36 which can be of low height and close together for engaging the operative edges 29. The selectors 10 all have, at their lower ends 22, a sloped part 38 and a downward projection 40 for engaging the associated jack 14.

The dial cam system is shown generally in Figure 4. A number of such systems can be used to complete an annular array. The system illustrated is for knitting selectively but the same principles can be applied for selecting for transfer.

An outer cam ring or segment 48 defines with an intermediate cam ring 54 a track 58 for dial needle butts. The track 58 is also defined by a stitch cam 50 movable along slot 52 for stitch adjustment. The track 58 has an initial part 56 for clearing the old loop on the dial needle 12. A bolt cam 60 can be inserted to make all needles knit but for selective operation jacks 14 are used.

To this end a track 64 for jack operating butts 18 is defined between the intermediate cam ring and an inner cam ring 62. The track does not have a presser cam acting to push the butts 18 back into the dial needle tricks 16. Instead a downwardly projecting rib 66 with a slope 67 passes through a slot 69 in trickwalls and engages the body of thejacks just clear of the butts 18. The jack track is thus uninterrupted and does not have a closed-off part through which broken buts 18 could not pass. The ring 62 is of two superposed layers with an upper layer 71 having an overhang 68 for projecting over the butts 18 for a short distance upstream of a selection position. The jack selecting butts 24 and the lower selector ends 22 are controlled by an inward facing camming edge 70 of the inner ring 62.

The function of the edge 70 with its recess 72 at the

selecting position will emerge. Generally speaking there is a radially inwardly extending overhang forming projecting shoulder parts 74 for lying over the butts 24 and facing and lying against the selectors 10. The recess 72 ends with a gradually curved slope 73 at the upper layer pushing all selectors back in against spring action. At the lower layer a slope 75 urges all rockers down at their innermost end so that even non-selected jacks are rocked once during a knitting cycle. This ensures that jacks remain freely movable for selection.

In use, when a dial needle is to form a knitted stitch, the pattern bit 30 permits the slide 28 to remain retracted (see Figure 3). The jack operating butt 18 passes under overhang 68 the jack having been racked by the rib 66. As the recess 72 reaches the selector 10, it springs radially outward unrestrained by the slide 28. The sloped part 38 is pushed into the recess 72 and against the selecting butt 24 of the jack urging it radially outward and downwards. The slope 25 on the butt 24 pivots the rocking jack, the overhang 68 having passed over the operating butt 18 to permit it to project upwards. The butt 18 movement now conforms to the track 64. As the jack 14 moves radially outward the butt 24 passes below the inner cam ring 62 securing the rocking jack positively in position. The jack 14 pushes the needle

12 to knitting height and is returned just in advance of the radially inward dial needle motion 12. The dial needle 12 hence does not push the jack 14 back. The paths for jack and needle butts remain segregated. The slope 67 of the rib 66 pushes the rockers so as to move the butt 18 back in, ready for the passing of the next arriving overhang 68.

When the dial needle is to form a float or to refrain from knitting, the pattern bit 30 projects the slide 28 (see Figure 2). At that time the selector 10 is pushed radially inwards by the cam face 70 so the edge 29 does not have to shift the selector 10 actively against spring pressure. The overhang 68 passes over butt 18 of the jack 14 as previously but when the recess 72 arrives, the selector 10 cannot spring radially outward being restrained by the slide 28. Subsequently the butt 18 passes below the radially outwardly inclined part of the inner cam ring 62 holding the butt 24 of the jack raised. That jack is hence kept in its inner radial position Subsequently the selector 10 detaches from the slide 28 and moves radially outwards taking the jack 14 with it to a limited extent until further movement is prevented by cam ring 62. The jack 14 remains however un-rocked. The dial needle 12 associated is not moved radially outward and the needle will not knit. The next arriving overhang 68 passes

over the butt 18 for a repetition if required of the selection cycle. Apart from the advantages indicated earlier, the drawings illustrate the simplicity and directness of the selection cycle and how simple and few the parts are for achieving it. The rocking jacks are solid so that if a cam is struck the risk of damage to trick walls is reduced. No pointed cams need to be used and a large number of pattern butt levels can be arranged compactly and in a robust construction.

Preferably the rocking jacks are of a plastic material or other material which is readily disintegrated by the mechanical parts of the system in the event of butt breakage. By omitting any butt pressing cam, the jack cam track remains open for butts to pass over the top of the needle bed without jamming. Thus isolated butt breakages can be dealt with by replacing the broken jack without the broken off butt having to be located and removed and without progressive butt breakage due to jamming.

In an alternative embodiment, not illustrated, the selecting mechanism may be operated electromagnetically. In that event the number of heights of pattern butts 36 can be reduced and a selecting mechanism can be chosen in which the selectors 10 are not sprung but can be rocked or even slid vertically using a camming action

between electromagnetically operated devices and the selectors 10. However the jack camming arrangement would be unchanged.

CLAIMS:

1. A dial needle selecting mechanism having a patterning means associated with a dial cam system, selectors controllable by the patterning means individually associated with and arranged transversely to dial needles, jacks in dial needle tricks operable by the selectors to selectively project jack operating butts so as to cause a dial needle to perform its appropriate function,

characterised in that each of the selectors (10) is held non-slidably at an end (20) remote from the dial cam system for selective spring biased projection at an end (22) close to the dial cam system to engage and pivot a selecting end of an associated rocking jack (14) to project the jack operating butt (18).

2. A mechanism according to claim 1 further characterised in that the patterning means include a drum (26) slides (28) operable by the drum (26) to engage a pattern butt (36) on each of the selectors (10) to selectively hold the selectors (10) radially inwardly against spring bias, and in that a resiliently deformable selector part (34) is provided between the end (20) remote from the dial cam system and the levels occupied by the pattern butts (36) for spring biased projection at the end (22) close to the dial cam system.

3. A mechanism according to any of the preceding claims further characterised in that each selector (10) has a sloped part (38) at the end (22) close the dial cam system for engaging the selecting end of the associated jack (14) and the selecting end has a butt (24) for resisting radially outward movement of the jack (14) when the butt (24) is projected and the operating butt (18) is retracted in the dial needle trick (16).

4. A mechanism according to claim 3 further characterised in that the selecting end butt (24) has a sloped part (25) on its radially outward side for facilitating the camming of that butt (24) into the dial trick (16).

5. A mechanism according to any of the preceding claims further characterised in that the dial cam system has a generally circularly cam face (70) for holding the selectors (10) radially inwards against spring bias, a part (72) at which such a cam face is discontinued to permit selectors (10) not restrained by the patterning means to pivot associated rocking jacks (14) and in that a portion of the circularly arranged part downstream of the recess (72) provides an overhang for the operating butt to resist its belated projection.

6. A mechanism according to any of the preceding claim

1 to 5 further characterised in that the dial cam system provides an open track (64) for projected operating butts (18) which is spaced from a needle butt cam track (58) and camming zone for needle operating butts and adjacent the jack cam track (64) there is arranged a camming projection (66) passing through slots (69) in the trick walls to cause the operating butts (18) to be retracted without a pressing cam operating on those butts (18) after the jacks (14) have been returned radially inwards by the jack cam track (64)

7. A mechanism according to claim 6 further characterised in that a camming means (73) is provided upstream of the camming projection (66) to cause all non--selected rocking jacks (14) to be rocked prior to selection.

8. A mechanism according to any of the preceding claims further characterised in that the rocking jacks (14) are of a comminutable material so that on butt breakage the broken-off butts are disintegrated between relatively moving parts of the dial.

9. A mechanism according to claim 8 further characterised in that the rocking jacks (14) are of a plastic material.

10. A dial needle selecting mechanism having a patterning means associated with a dial cam system, selectors individually controllable by the patterning means individually associated with and arranged transversely to dial needles, jacks in dial needle tricks operable by the selectors to selectively project jack operating butts so as to cause a dial needle to perform its appropriate function,

characterised in that the selectors (10) have an end (22) close to the dial cam system to engage and pivot a selecting end of an associated rocking jack (14) to project the jack operating butt (18) into an open track (64) separate from a needle butt cam track (58).

11. A mechanism according to claim 10 further characterised in that adjacent the cam track (64) there is a camming projection (66) passing through slots (69) in the trick walls to cause the operating butts (18) to be retracted without a pressing cam operating on those butts (18) after the jacks (14) have been returned radially inwards by the jack cam track (64).

12. A mechanism according to claim 11 further characterised in that a camming means (73) is provided upstream of the camming projection (66) to cause all non-selected rocking jacks (14) to be rocked prior to selection.

13. A mechanism according to any of claims 10 to 12 further characterised in that the rocking jacks (14) are of a comminutable material so that on butt breakage the broken-off butts are disintegrated between relatively moving parts of the dial.

14. A dial and cylinder knitting machine having a dial needle selecting system according to any of the preceding claims.

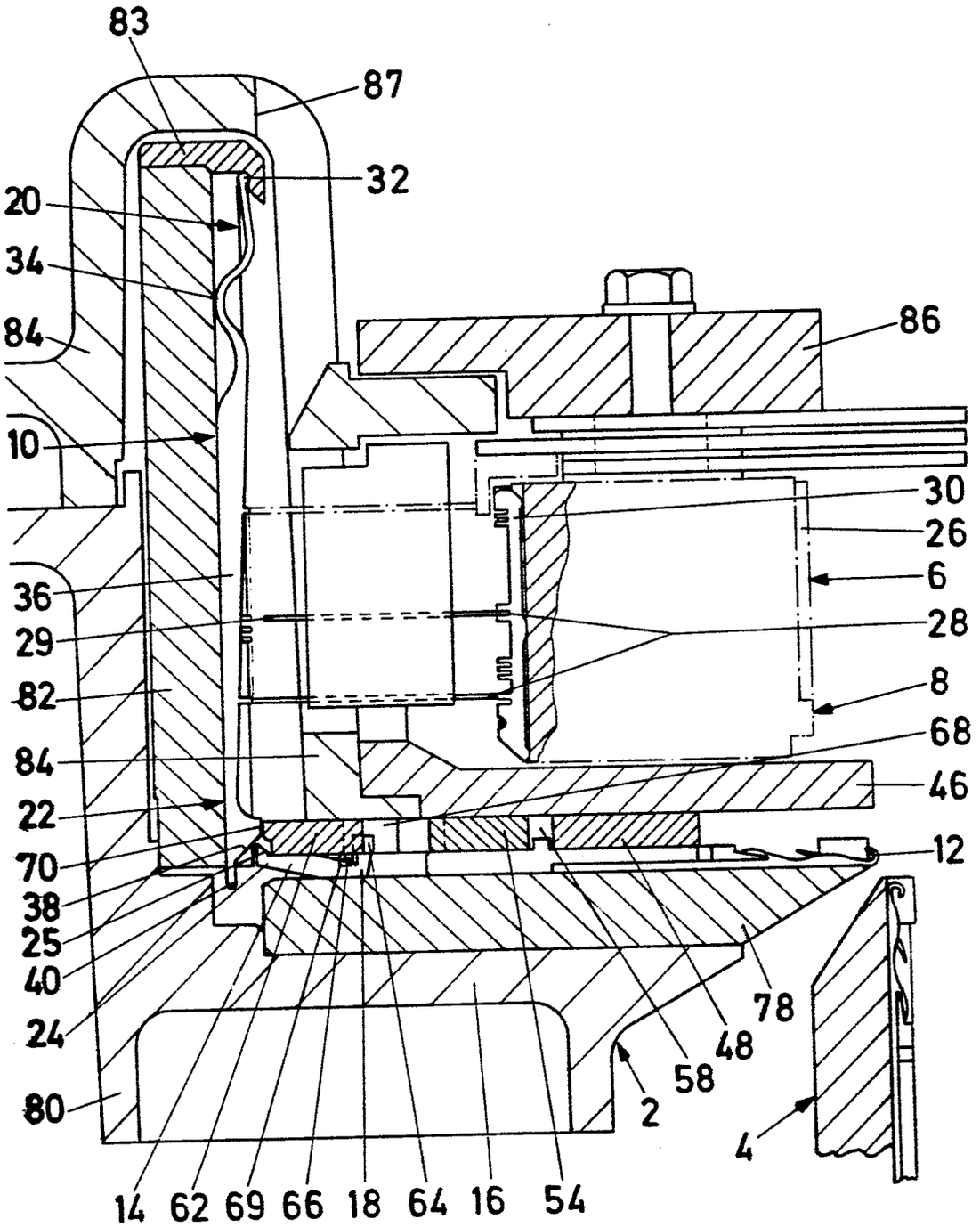
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Fig.1

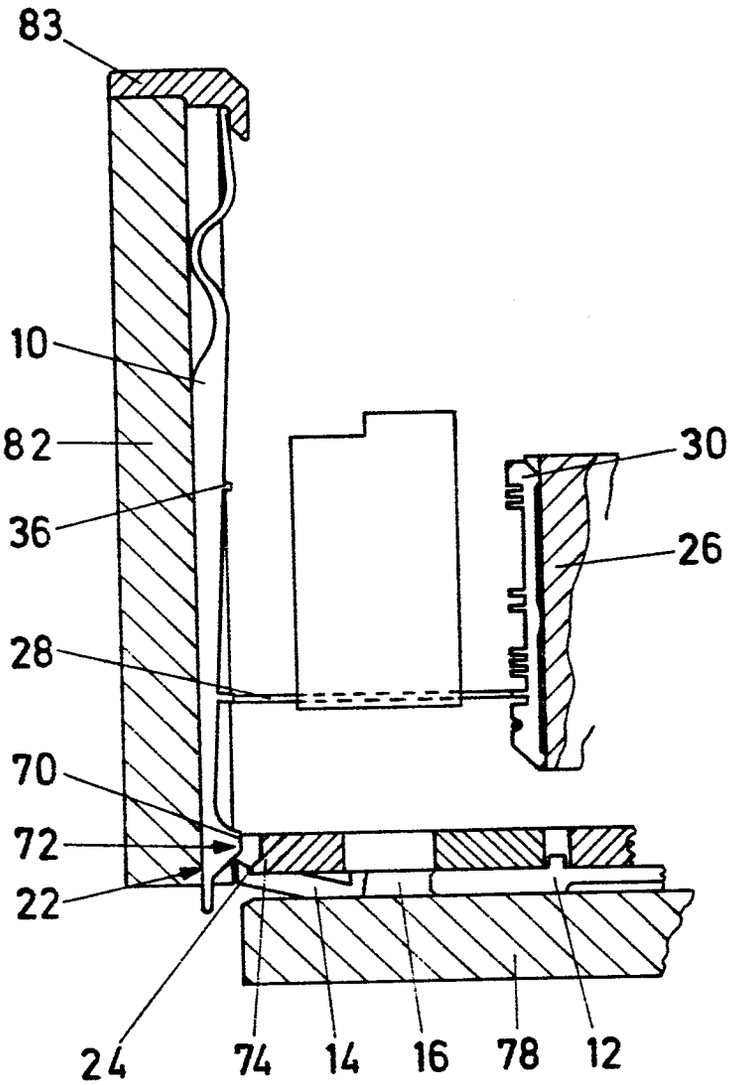

Fig.2

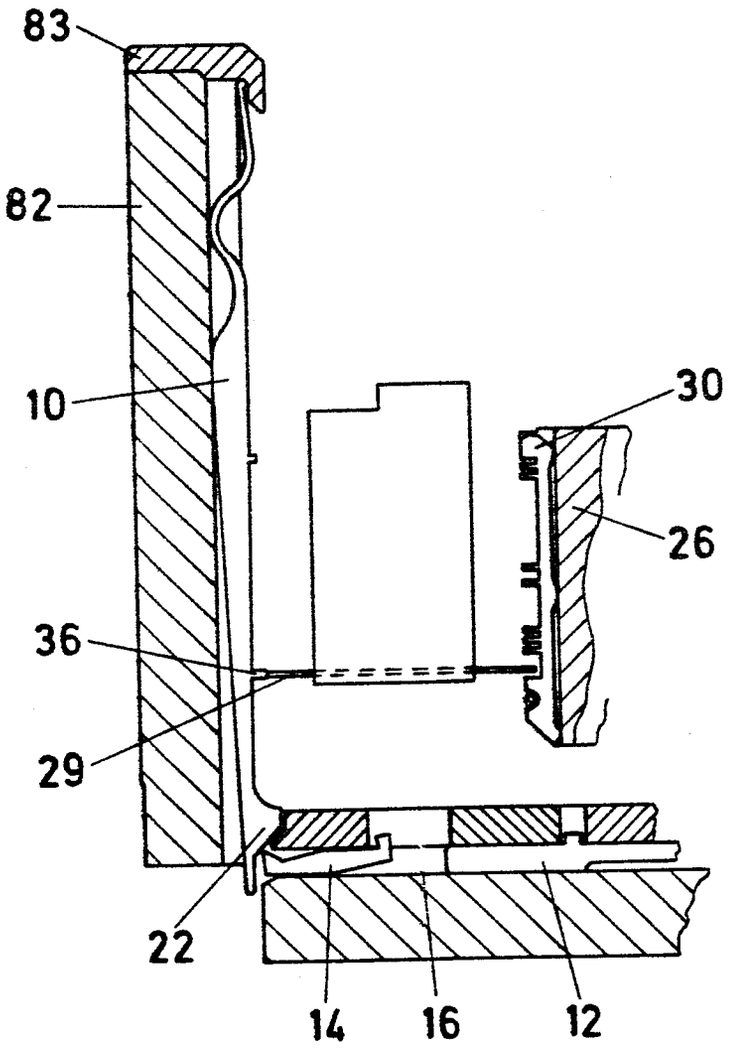

Fig.3

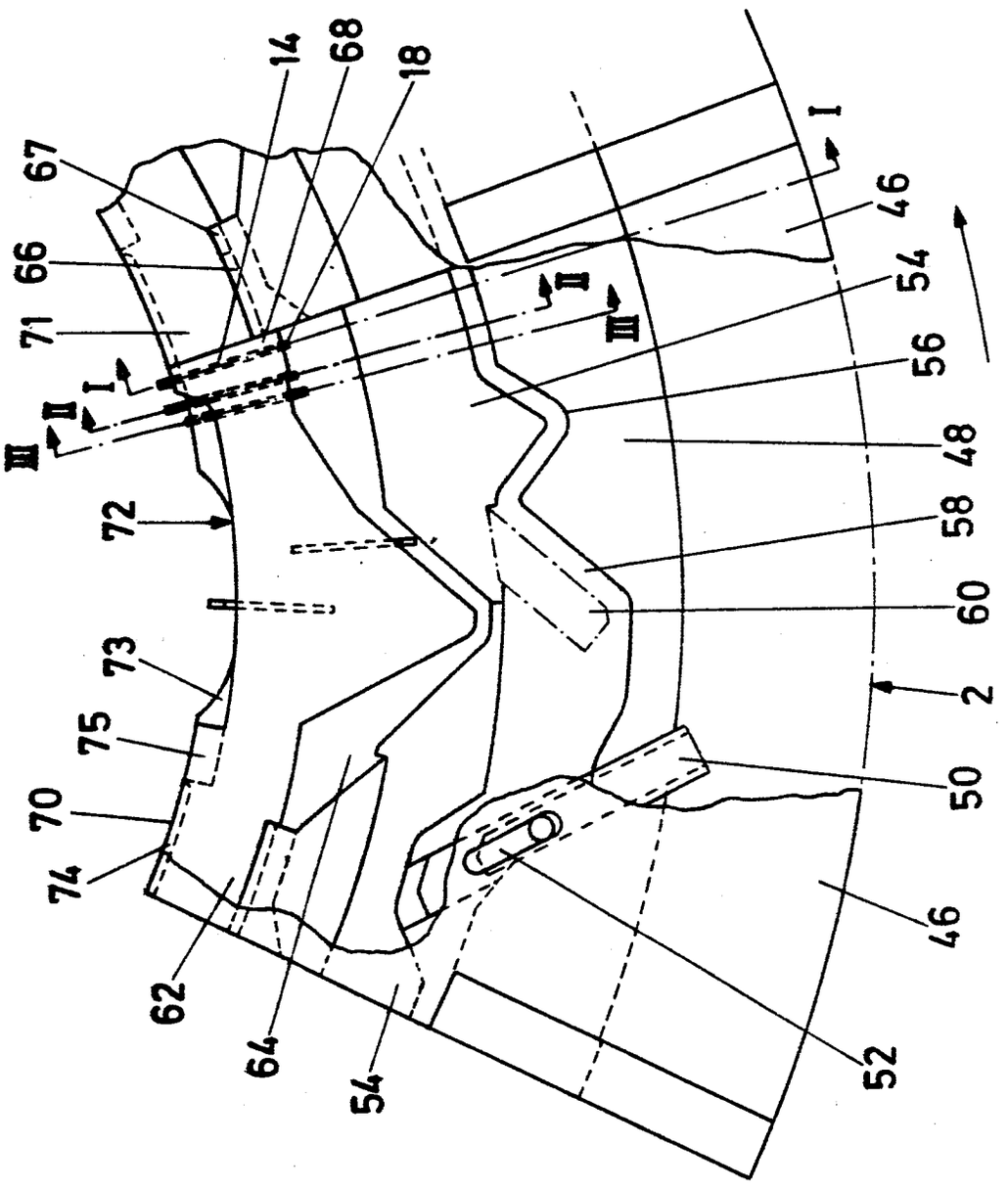
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Fig.4

European Patent Office

EUROPEAN SEARCH REPORT

0117660 Application number

EP 84 30 0704

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
A,D	DE-A-1 635 798 (FOUQUET-WERK)		D 04 B 15/68
A	US-A-3 890 804 (ANGLADA)		
A	DE-A-1 966 886 (JUMBERCA)		
A	DE-A-3 023 077 (ELITEX)		

TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
D 04 B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	05-06-1984	VAN GELDER P.A.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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