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54 **Improved picker device for circular knitting machines.**

57 The invention relates to a picker device including two pickers (3) movable between two positions under the action of the motion of needle or slider butts (6).

To avoid that after a needle has been excluded from knitting the respective picker (3), in moving back into its home position, may rub continuously against the butts (6) left in the knitting track, the pickers (3) are each provided with a lug (16) remote from the working end, and two contoured levers (18, 19) are provided having each a hooked end (18a, 19a) for blocking a respective picker (3) in the high position thereof through the respective lug (16).

The picker (3) is released upon actuation of the other picker (3) by the needle or slider butts (6). The related lug (16) causes the levers (18, 19) to diverge, which results in the first picker (3) being released and the second picker (3) being blocked.

Instead of two levers (18, 19) it is possible to provide a single lever having adequate shaped ends.

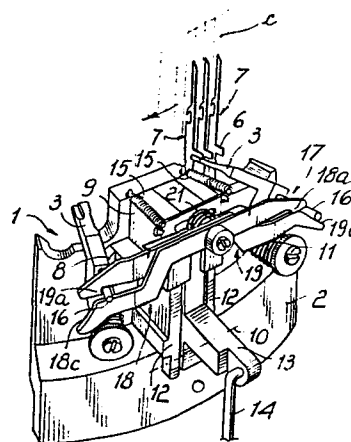


Fig. 3



This invention relates to an improved picker device for circular knitting machines, comprising two needle raising pickers pivotally carried on a supporting structure adjacent the needle cylinder and
5 extending substantially radially to the needle cylinder, the pickers having each one end for engagement with butts of needles or needle lifting instruments and being movable with such ends along substantially an arc of a circle between a low position of engagement
10 with said butts and a high position of release thereof.

A device such as this is well known to persons skilled in the art. The pickers are normally held in the low or home position by a torsion spring, which also provides for their returning to the home position
15 after they have been engaged by the butts and moved to the high position. As the pickers are moved back into their home positions, however, they slide at first on the butts of the needles or needle lifting instruments (e.g. sliders) which keep moving at the same level as
20 the home position of the pickers. It will be appreciated that said sliding action, which reiterates after each needle lifting or raising operation, results with time in a higher rate of wear of the pickers and butts.

As the machine rotational speed increases, that
25 wear action, of course, also increases. However, it also increases because at higher speeds a more powerful return spring must be provided, such as to

prevent the pickers from being, under the striking action of the butts of the needles or needle lifting instruments, flung away at a higher velocity than the linear velocity of the needles or needle lifting instruments.

- 5 A more powerful spring, of course, increases the force applied on the butts which move past at the level of the picker home position, thus increasing the rate of wear as well.

- 10 On the other hand, in the course of the knitting cycle, breakage of the needle butts or needle lifting instruments may also occur. A broken butt may move incorrectly at the level of the pickers and thus damage them or damage other machine parts, and the more so the higher is the rotational speed. Also at a high
15 speed, there exists the danger of the needles or needle lifting instruments bouncing so that their butts, in striking against certain cams of the machine, may be dislodged from their track and collide with the pickers, thus damaging them and/or suffering mutual
20 damage.

- For all the above reasons, conventional picker devices are often liable to develop malfunctions that involve halting the machine for the operations of inspection and/or replacement of damaged parts, which
25 obviously results in a considerable loss of production.

It is a primary object of this invention to provide an improved picker device for circular knitting machines, which can overcome the problems outlined above and the wearing out of pickers and butts of

needles or other needle lifting instruments, and this also at very high knitting rates.

Another object of this invention is to provide a device as indicated, which can effectively avoid
5 damage to and/or breaking of the pickers, while allowing the traditional construction of needle raising picker devices to be kept for the most part unaltered, thereby it advantageously lends itself for installation on existing machines as well.

10 These objects, and other objects in part explained above and in part evident from the detailed description which follows, are achieved by an improved picker device for circular knitting machines of the type specified in the preamble, which is characterized in
15 that at the end remote from the working end the pickers have lugs cooperating with guiding and blocking means adapted to block the pickers alternately at the high position thereof and release the pickers alternately toward the low position thereof.

20 In a device so configured, the pickers are blocked once they have reached their high position and hence are not immediately returned to the home position. Thus, they are no longer allowed to slide over the butts of needles or sliders left in the operative track. In this
25 way any wear of both the pickers and butts is fully prevented and the machine can be operated even at high speeds without problems.

Expediently, the guiding and blocking means, preferably comprising contoured levers, are so configured
30 as to act alternatively on the pickers. Thus, the

picker which is being engaged by the butts of needles or sliders for transfer from the low position to the high position is enabled itself to provide for releasing the other picker, which can occupy accordingly its position of engagement for the next rotation of the needle cylinder in the opposite direction. The picker which raised the butts remains instead in turn blocked.

It will be appreciated that with a simple arrangement of levers and lugs on the pickers, i.e. means located externally to the machine, the traditional construction of the picker device is not significantly altered. Therefore, the inventive device may be advantageously incorporated to existing machines as well, without requiring any complicated conversion work.

Advantageously, the picker supporting structure may be made tiltable outwardly to a position such that the working ends of the pickers no longer interfere with the area to be occupied by the needle or slider butts, so that any broken butts are prevented from striking the pickers and damage them.

According to a further embodiment it is possible to provide a fixed supporting structure and raise both the pickers to the high position as a rest position.

Further features and advantages of the invention will become apparent from the following detailed description of two preferred embodiments thereof, given herein by way of example only with reference to the accompanying drawings, where:

Figure 1 is a perspective view of a first embodiment of a picker device according to the invention, shown in its home position;

5 Figure 2 is a fragmentary sectional view taken along a symmetry plane of the device of Figure 1;

Figure 3 is a perspective view of the same device in its working position at the outset of a first needle raising movement;

10 Figure 4 is a diagram showing the position and movement of the pickers during the phase of Figure 3;

Figure 5 is a diagrammatic representation of the operation of the guiding and blocking means during the phases of Figures 3 and 4;

15 Figure 6 is a perspective view of the device at the end of the raising phase started in Figure 3;

Figure 7 is a diagram covering the phase of Figure 6;

Figure 8 illustrates the same phase as Figure 6, but with pickers acting on needles instead of sliders;

20 Figure 9 is a perspective view of the device at the outset of the raising phase in the opposite direction to that of Figures 3-8;

Figure 10 is a diagram covering the phase of Figure 9;

25 Figure 11 is a perspective view of the device at the end of the raising phase of Figure 9;

Figure 12 is a diagram covering the phase of Figure 11.

Figure 13 is a perspective view of a second embodiment of a device according to the invention, in the inoperative position thereof;

Figure 14 is a schematical front view of the
5 device of Figure 13;

Figure 15 is a perspective view of the device of Figures 13 and 14, in the ready for knitting position thereof;

Figure 16 is a schematical front view of the
10 device of Figure 15;

Figure 17 is a sectional view of the device of Figures 13-16 taken along a vertical plane of symmetry;

Figures 18, 19, 20 and 21 are schematical
15 illustrations of the main operation phases of the device of Figures 13-17;

Figures 22 and 23 illustrate a further possible embodiment of the ends of the guiding and blocking means in the device of Figures 13-17.

20 In Figures 1-12, a picker device 1 is shown which comprises, in a manner known per se, a supporting structure 2 located adjacent a needle cylinder C (Fig. 3) and carrying two pickers 3 in an articulated
25 fashion. The latter are each formed with a traditional working end adapted for engagement with butts 4 of needles 5 (Figure 8) or butts of other needle

lifting instruments, in particular butts 6 of sliders 7 (Figures 3,6,9,11).

5 The pickers 3 are journaled, along converging axes, to respective opposedly located lugs 8 on a carrier body 9 which is journaled to the structure 2 along an axis 10 substantially perpendicular to the plane of symmetry of the structure. Between each picker 3 and respective lug 8, there is arranged a conventional torsion spring 11, which acts as a
10 return spring, also in a conventional manner.

With the carrier body 9, which is accommodated between two uprights 12 rigidly attached to the structure 2, there is rigidly connected an actuating arm 13, projecting substantially in a radial
15 direction, whereto a link 14 or the like is connected which is interlocked with a programmed control member of the machine. With this arrangement, the pickers 3 can be moved away from the area or space to be occupied by the butts 4 or 6 when the
20 device 1 is inoperative, e.g. while the leg portions of stockings being knitted. The related, home, position is shown in Figure 1. In this position, any broken butts of needles or sliders are prevented from violently striking the pickers, thereby the latter
25 cannot be damaged by stray butts.

Between the top of the structure 2 and upper portion of the carrier body 9, two springs 15 are

stretched, so that as the link 14 is released, e.g. under control by the machine main drum, the picker-device 1 is brought into its working or operative position, shown in detail in Figure 3. In
5 this position, the pickers 3 extend substantially radially to the needle cylinder and their working ends are movable substantially along an arc of a circle between a low position of engagement with the butts 4 or 6 of the needles 5 or sliders 7, and a high
10 position of release of the butts.

In accordance with this invention, at their ends remote from the working ends, the pickers 3 are each provided with a lug 16 cooperating with guiding and blocking means generally indicated at 17.
15 Such means are adapted to block the pickers 3 alternately in the high position and alternately release them toward the low position, as will be explained hereinafter. More in detail, the lugs 16 have a peg-like configuration and are substantially
20 aligned with the working ends of the respective pickers 3. According to a first embodiment, the guiding and blocking means 17 comprise a pair of contoured levers 18 and 19, which are individually journaled to the carrier body 9 externally to the
25 device 1 by means of a pivot pin 20 extending in the plane of symmetry of the device 1 and directed substantially radially to the needle cylinder. Around the pin 20 for the levers 18 and 19, there is provided a torsion spring 21, whose ends engage a
30 respective one of the levers 18, 19 to urge the levers

to pivot in opposite directions.

The levers 18,19, which are journaled substantially at the middle, have each unequal arms so configured as to have one arm of a lever to correspond symmetrically to the opposed arm of the other lever. More precisely, each lever has an upper arm whose end is configured at the bottom as a hook 18a, respectively 19a, adapted to engage and retain the lug 16 of the associated picker 3. The other arm of each lever is bent downwards and has a portion formed with an upper profile 18b, respectively 19b, substantially parallel to the major dimension of the corresponding lever and ending in an end portion directed downwardly and having an oblique upper profile 18c, respectively 19c.

The profiles 18b,18c,19b,19c define guiding profiles for the lugs 16, which are movable between the top or upper arm of a lever and the lower or bottom associated arm of the other lever, as will be explained hereinafter. Owing to the provision of the spring 21, the ends of the levers 18,19 always engage with the lugs 16. Advantageously, the sloping profile 18c, respectively 19c, is slightly concave upwardly.

This device operates as follows.

At the beginning of the operation of exclusion of the needles from knitting, the device 1 occupies the position shown in Figure 3. The first butt 6 of the sliders 7 (or first butt 4 of the needles 5) engages the right-hand picker 3 in the figure, turning the cylinder in the direction of the arrow. The butt 6 entrains the picker 3 therealong in a conventional

fashion, as schematically shown in Figure 4. In this manner, the lug 16 of the right-hand picker first slides over the sloping profile 19c of the lever 19 until it meets the hooked end 18a of the other lever 18 (Figure 5). As the rotation of the picker in question continues, the related lug 16 spreads the levers 18,19 apart until the hooked end 19a of the lever 19 releases the lug 16 of the other picker, and the lug 16 of the right-hand picker passes the hooked end 18a of the lever 18. The left-hand picker 3 snaps in the meantime into its conventional home position, where it remains available for exclusion of the needles in the opposite direction of rotation of the needle cylinder, while the right-hand picker 3 is held blocked by the hooked end 18a of the lever 18, owing to the action of the spring 21 (Figure 6). The butt 6 is released in a conventional way (Figure 7). The same would occur if needles 5 (Figure 8) are substituted for the sliders 7.

During the return stroke of the needle cylinder, the same movement sequence takes place, although reversed for the pickers 3 and levers 18,19. The lug 16 of the left-hand picker 3 (which is engaged by a butt 6 as shown in Figure 10) slides over the sloping profile 18c of the lever 18 (Figure 9), spreads the levers 18,19 apart causing the lug 16 on the right-hand picker to be released, and remains blocked by the hooked configuration 19a as the left-hand picker 3 reaches its high position (Figure 11 and 12). The arrangement is now the starting one, ready for a fresh

exclusion with the following reversal of the needle cylinder direction of rotation.

In the embodiment of Figures 13 to 17, the guiding and blocking means for the pickers 3 comprise
5 a single lever 22, pivoted centrally to a fixed support 23 and having profile ends 22a and 22b. The lever ends are configured substantially hook-like, the hooks facing in opposite directions, and are respectively provided with a guiding profile
10 substantially in the shape of an arc of a circle whose center is non-coincident with the rotation center of the respective picker 3. The lever 22 is subjected to the action of a torsion spring 24, which tends to pivot it in a counterclockwise direction relatively to
15 the fixed structure 25. With this arrangement, the right-hand end 22b of the lever 22 has its hook facing upwards and the left-hand end 22a has a hook facing downwards.

According to a more preferred embodiment of the invention, the end profiles of the lever 22 are formed
20 on separate plate-like portions attachable to the lever 22 such as to allow adjustment in the lengthwise direction of the lever itself.

The pickers 3 are in this case pivoted directly to the fixed structure 25, similarly to conventional
25 devices. They are provided, however, in addition to the previously described lugs 16, with second lugs 26 directed radially in concurrent directions, wherewith respective vertical pegs 27 carried on a structure 28 movable vertically with respect to the fixed structure
30 25 are arranged to cooperate. More specifically, the pegs 27 are rigid with a horizontal cross-piece 29, carried on a small guiding cylinder 30 movable

vertically in a cylindrical seat defined in the fixed support 23. The small cylinder 30 has a through-going cross opening 31 which receives one end of a control lever 32, pivoted to a fixed arm 33 of the fixed structure 25 and having another end connected to a link 34. The latter is controlled by the machine program, as explained hereinafter. The control lever 32 is subjected to the action of a torsion spring 35 which holds it in the position of Figures 13 and 17, i.e. in an inoperative condition to which there corresponds a lowered position of the movable structure 28. In this condition, the pegs 27 will depress the radial lugs 26 of the pickers 3, and the latter are both held in the raised position, out of the path of travel of the butts of needles or sliders. As the link 34 is pulled downwards, the movable structure 28 is raised and the pickers 3 are both released to the low position, which corresponds to the traditional position of engagement with the butts during the phase of exclusion of the needles from knitting.

The horizontal cross-piece 28 has a substantially radial portion 36, which cooperates with a tab 37 on the lever 22. The arrangement is such that the tab 37 and portion 36 oppose the bias of the torsion spring 24 acting on the lever 22. In the inoperative position of the device (Figures 13, 14 and 17), the lever 22 is held, by the portion 36 and tab 37, in a rotated position such that its ends 22a and 22b are out of the path of travel of the lugs 16 of the

pickers 3. With the device in the operative position (Figures 15 and 16), the lever 22 is released by the portion 36 under the bias of the torsion spring 24 to a position whereat its ends cooperate with the lugs 16 in the following manner.

Initially (Figure 15), both pickers 3 are released to the position whereat their working ends are level with the working track of the butts of needles and sliders. In the first direction of reciprocation of the needle cylinder, the lug 16 of the right-hand picker, in moving as shown in Figure 18, engages with the profile end 22b of the lever 22, to cause a progressive rotation of the same in a clockwise direction, against the bias of the torsion spring 24. Upon the right-hand picker reaching its highest position, its lug 16 remains blocked in the hooked end 22b of the lever 22 owing to the action of the spring 24 (Figure 19).

In the opposite direction of reciprocation, engaged by the butts is the left picker 3 and its lug 16, in following the traditional rotational movement of the picker, engages the profile end 22a of the lever 22, raising it such that the lever 22 is again turned in the clockwise direction (Figure 20). At the end of the usual movement of the left-hand picker, the related lug 16 remains blocked by the hooked end 22a, while that of the right-hand picker is released from the hooked end 22b (Figure 21).

It will be understood that from now on there will occur alternate blocking and releasing of the

lugs 16 similarly to the embodiment of Figures 1-12, but with the significant material advantage of having a single lever.

Of course, the profile ends 22a and 22b of the lever 22 may be reversed, as shown in Figures 22 and 23. In this case, also reversed would be the torsion spring 24 and the arrangement of the tab 37. The operation would be equivalent to that described hereinabove.

It will be appreciated from the foregoing description that with the pickers 3 blocked in the butt releasing position, the pickers can no longer rub against the butts left in the knitting track, as is instead the case with prior devices, by virtue of the bias effect of the picker torsion spring. Each picker 3 is automatically returned to its traditional home position only upon actuation of the other picker 3. This allows knitting even at very high rates, without undergoing the wear problems which affect, as outlined hereinabove, conventional machines. It should be also noted that a picker 3, being usually located at the high position, does not hinder the movement of the butts in the high track, since the latter would pass the picker above it. In the first embodiment, it would be anyhow possible to move the pickers 3 away from the position adjacent the cylinder and bring them to the home position of the device, as shown in Figure 1.

Advantageously, the levers 18 and 19 or 22 operate, so to speak, automatically, i.e. without requiring any specially provided control, thereby the device is

especially simple from the constructional standpoint.
The incorporation of the inventive device to existing
machines poses no problems.

Of course, the device described hereinabove is
5 susceptible to many modifications and variations,
without departing from the scope of the instant
inventive concept. Thus, as an example, the levers 18,
19 could have a different profile configuration, or
the carrier body 9 be made rigid with the supporting
10 structure 2.

CLAIMS

1 1. An improved picker device for circular knitting
2 machines, comprising two needle raising pickers (3),
3 pivotally carried on a supporting structure (2) adjacent
4 the needle cylinder (C) and extending substantially
5 radially to the needle cylinder (C), the pickers (3)
6 having each one end for engagement with butts (4,6) of
7 needles (5) or needle lifting instruments (7) and being
8 movable with such ends along substantially an arc of
9 a circle between a low position of engagement with said
10 butts (4,6) and a high position of release thereof,
11 characterized in that at the end remote from the working
12 end the pickers (3) have lugs (16) cooperating with
13 guiding and blocking means (17,22) adapted to block
14 the pickers (3) alternately at the high position thereof
15 and release the pickers (3) alternately toward the low
16 position thereof.

1 2. A device according to Claim 1, characterized in
2 that said lugs (16) have a peg-like configuration and
3 are substantially aligned with the working ends of the
4 respective pickers (3).

1 3. A device according to either Claim 1 or 2,
2 characterized in that said guiding and blocking means (17)
3 comprise two levers (18,19) journaled centrally and
4 individually to a carrier body (9) of said supporting
5 structure (2) along an axis directed substantially
6 radially to the needle cylinder (C), each lever (18,19)
7 including an upper arm having one end (18a,19a)
8 configured hook-like at the bottom to engage and hold
9 a respective one of said lugs (16), and a lower arm

10 having a portion (18b,19b) formed with a guiding top
11 profile substantially parallel to the major dimension
12 of the respective lever (18,19) and ending in a down-
13 wardly directed end portion with an oblique top guiding
14 profile (18c,19c), the upper arm of each lever (18,19)
15 being associated with the lower arm of the other lever
16 (18,19) and said lugs (16) being movable between the
17 upper arm of one lever (18,19) and the lower arm of the
18 other lever (18,19), said two levers (18,19) being
19 subjected to the action of a spring (21) urging them
20 to turn in opposite directions of engagement with said
21 lugs(16).

1 4. A device according to Claim 3, characterized in
2 that said oblique top guiding profile (18c,19c) is
3 slightly concave upwardly.

1 5. A device according to any one of Claims 1 to 4,
2 characterized in that said pickers (3) and said levers
3 (18,19) are carried on a carrier body (9) journaled to
4 said supporting structure (2) along an axis substantially
5 perpendicular to the plane of symmetry of said supporting
6 structure (2), said carrier body (9) being pivotable
7 between a working position where said pickers (3) are
8 located at the area to be occupied by said butts (4,6),
9 and a home position where said pickers (3) are located
10 outside said area to be occupied by said butts (4,6).

1 6. A device according to Claim 5, characterized in
2 that said carrier body (9) has an actuating lug (13),
3 for example operable through a link (14), to tilt said
4 carrier body (9) into said home position.

1 7. A device according to either Claim 1 or 2, characterized

2 in that said guiding and blocking means comprise a
3 lever (22) pivoted centrally to a fixed support and
4 having substantially hook-like profile ends (22a,22b)
5 for engagement with said lugs (16), the hooks facing
6 in opposite directions, said profile ends (22a,22b)
7 being each provided with a guiding profile substantially
8 configured as an arc of a circle the center whereof is
9 non-coincident with the rotation center of the respective
10 picker (3), said lever (22) being subjected to the
11 action of a torsion spring (24) arranged to oppose the
12 engagement of said lugs (16) with said guiding profiles
13 (22a,22b).

1 8. A device according to Claim 7, characterized in
2 that said profile ends (22a,22b) are formed on plate-
3 like portions attachable to said lever (22) for adjustment
4 capabilities in the lengthwise direction thereof.

1 9. A device according to any one of Claims 1,2,7 or 8,
2 characterized in that said pickers (3) are provided
3 with respective radial lugs (26) for concurrent
4 engagement with vertical pegs (27) on a structure (25)
5 vertically movable, under control by the machine program,
6 between the position whereat said pickers (3) are both
7 in the raised inoperative condition and a position
8 whereat said pickers (3) are both, in the lowered
9 operative condition.

1 10. A device according to either Claim 7 or 9,
2 characterized in that said movable structure (25) has
3 a substantially radial portion (36) arranged to cooperate
4 with a tab (37) on said lever (22) in a direction
5 opposing the bias of said torsion spring (24).

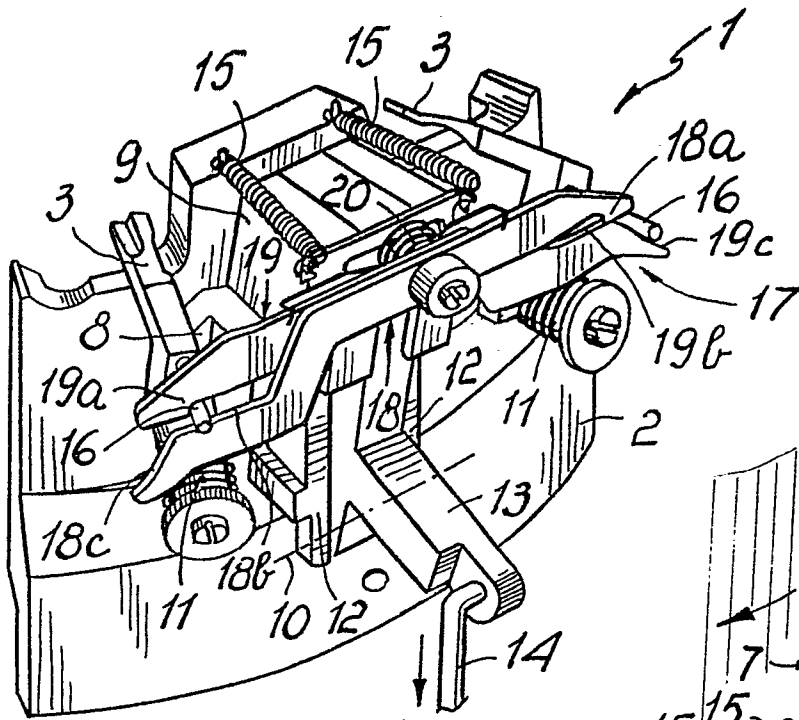


Fig. 1

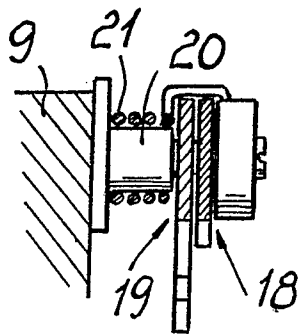


Fig. 2

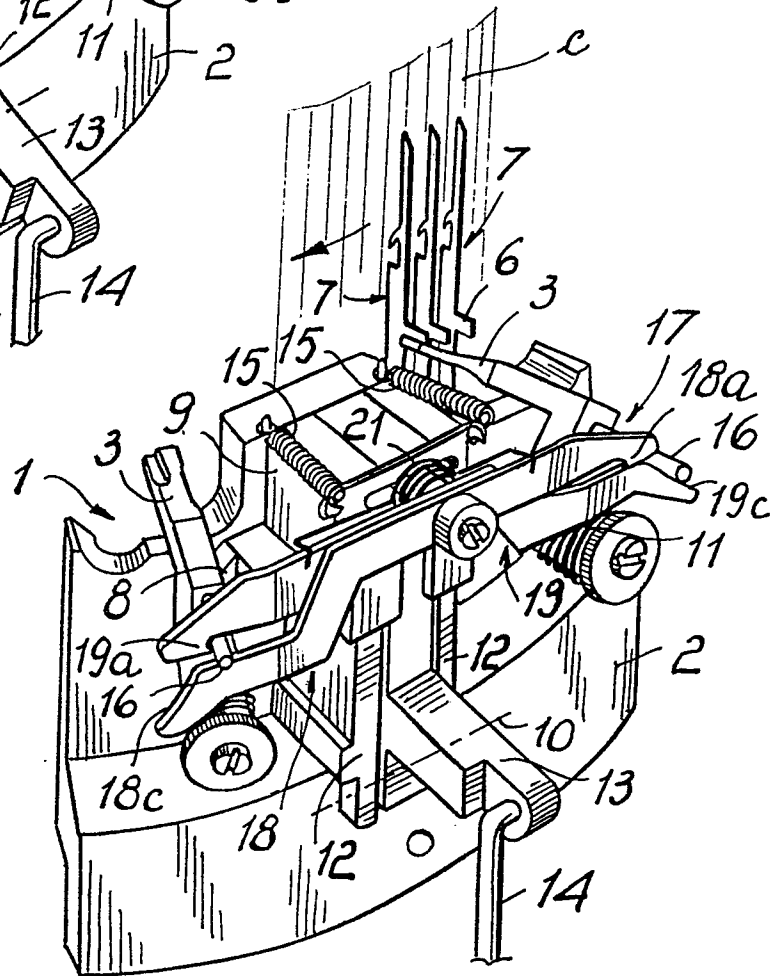


Fig. 3

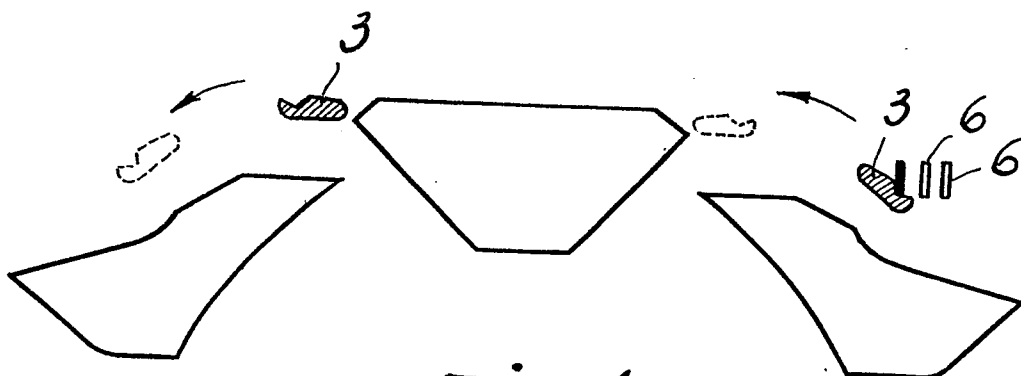
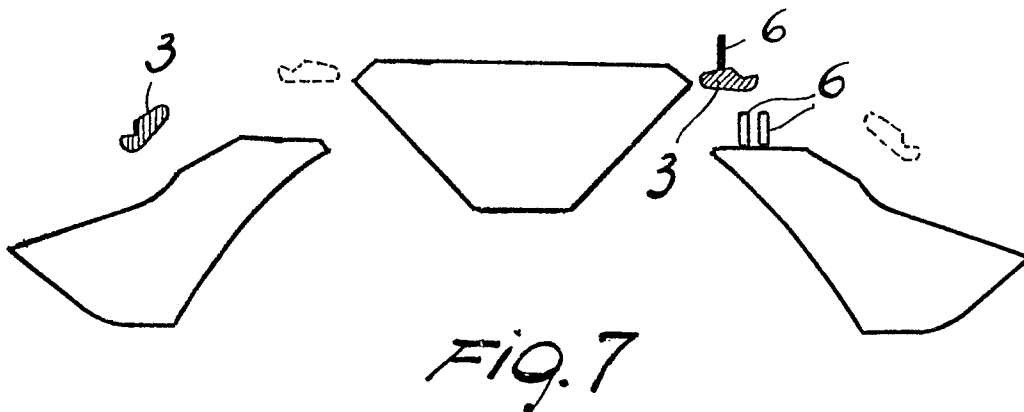
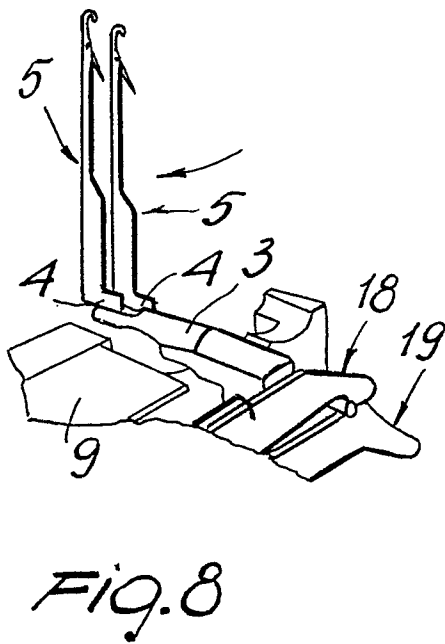
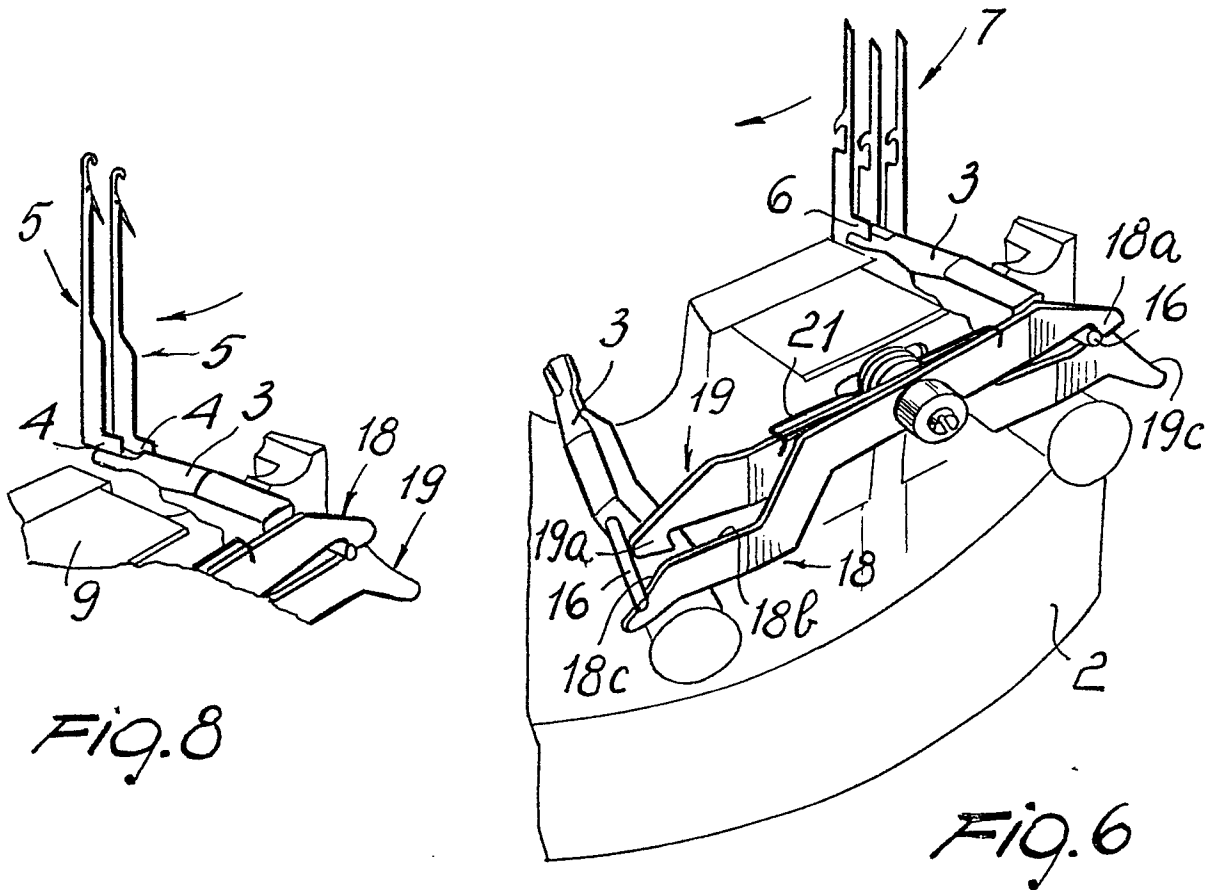
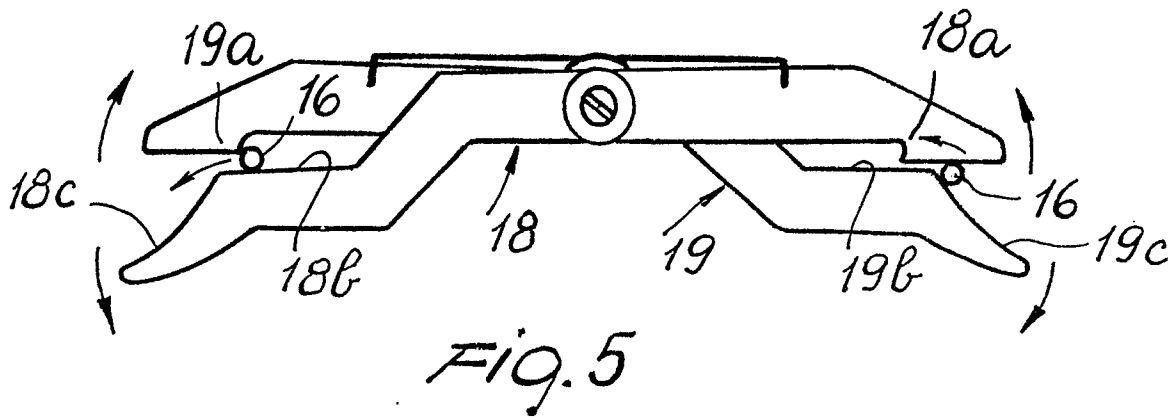


Fig. 4



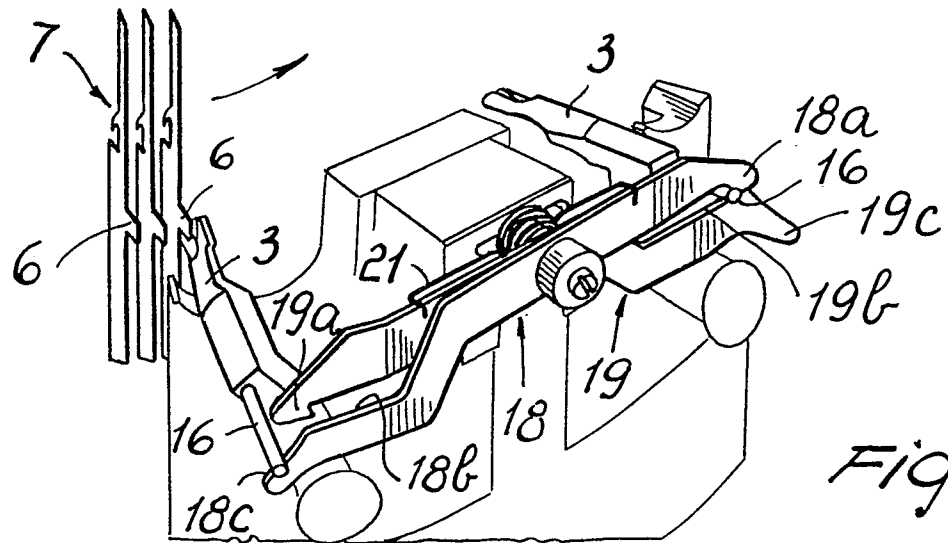


Fig. 9

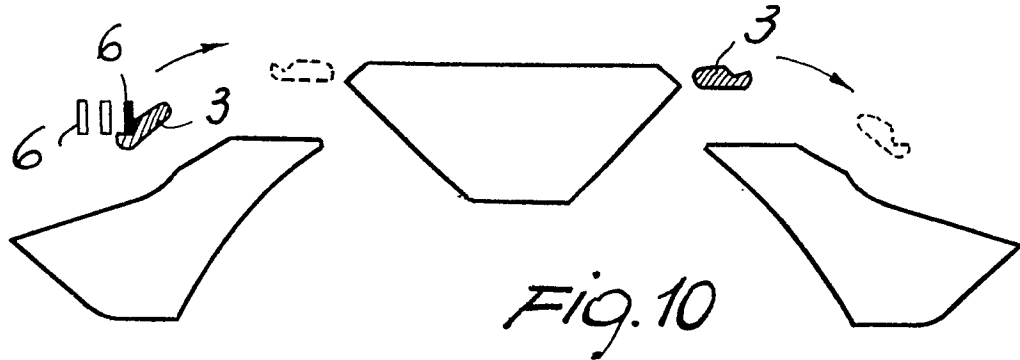


Fig. 10

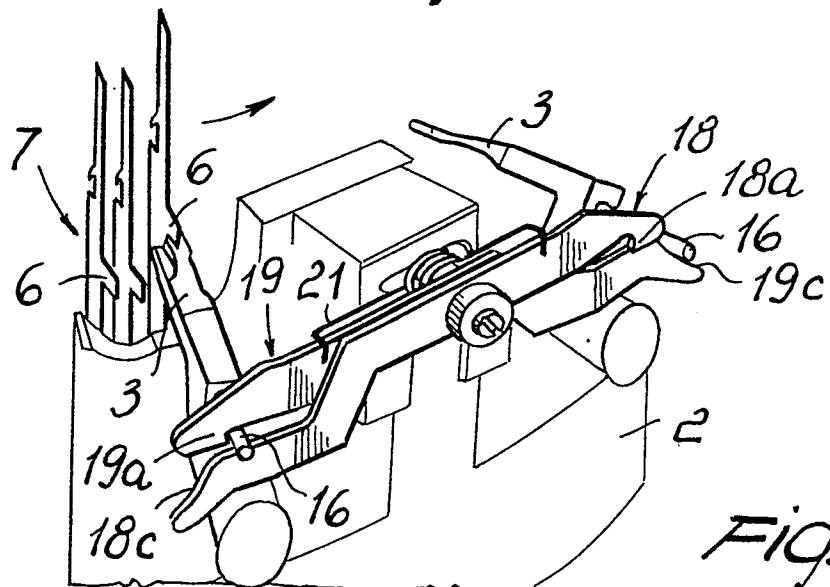


Fig. 11

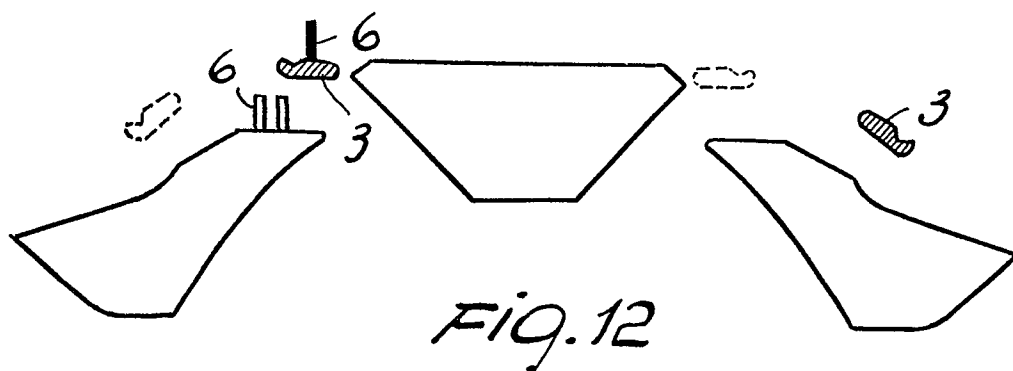


Fig. 12

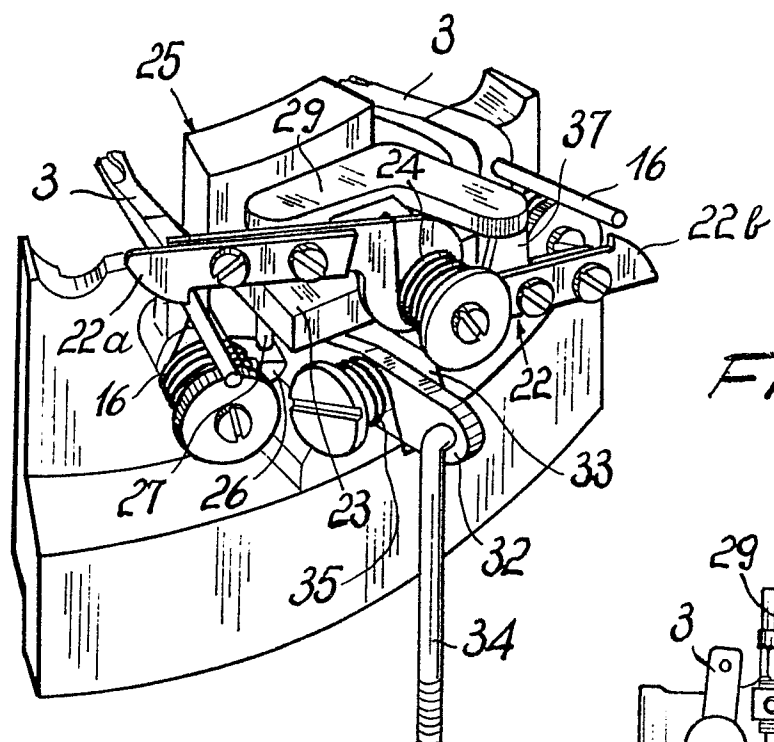


Fig. 13

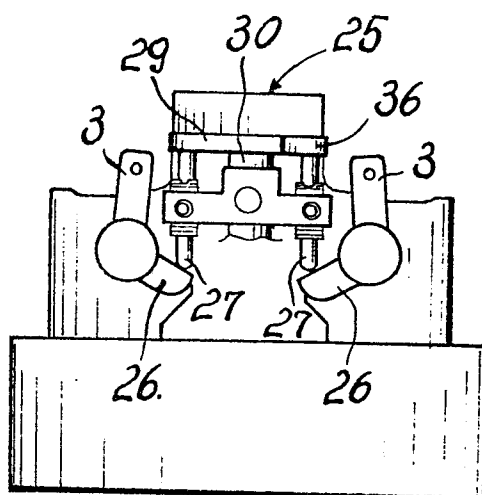


Fig. 14

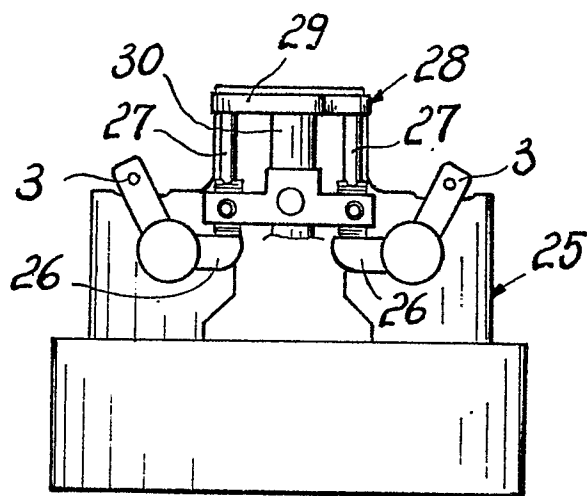


Fig. 16

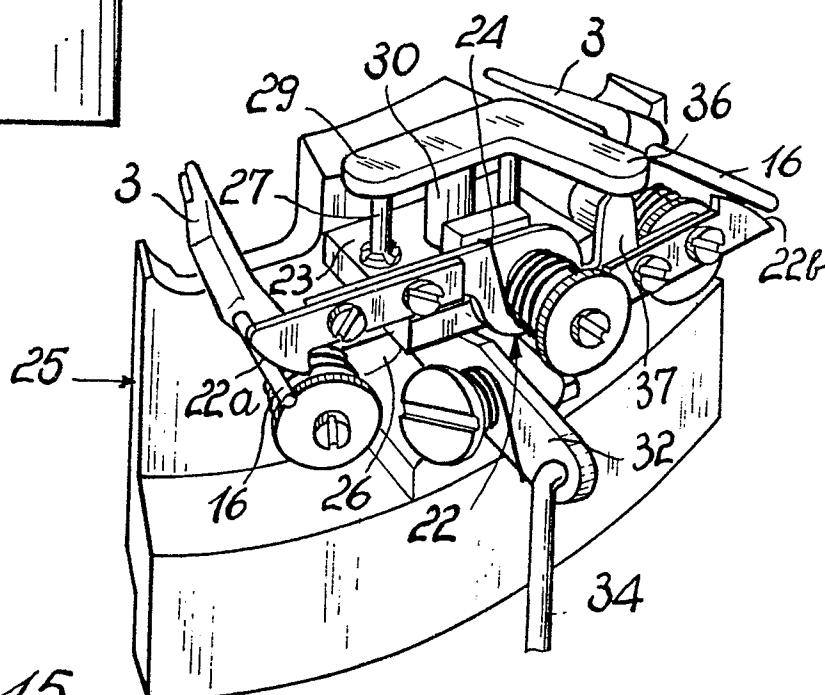


Fig. 15

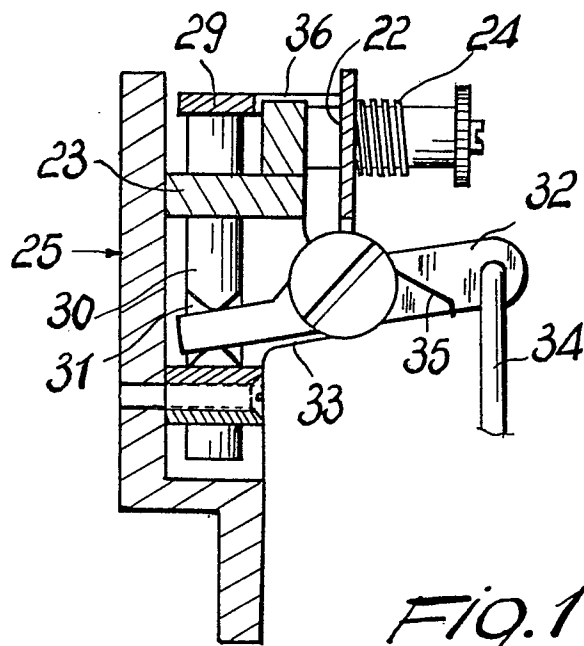


Fig. 17

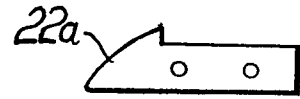


Fig. 22



Fig. 23

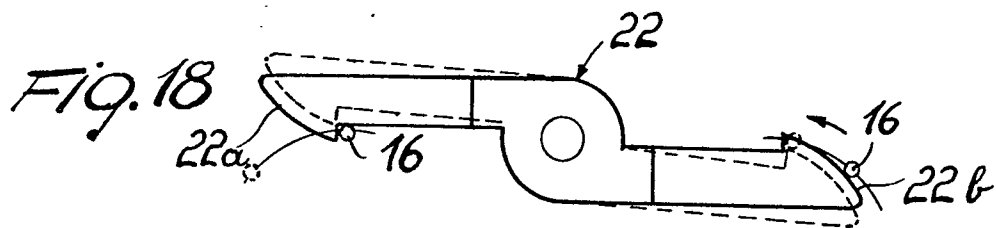


Fig. 18

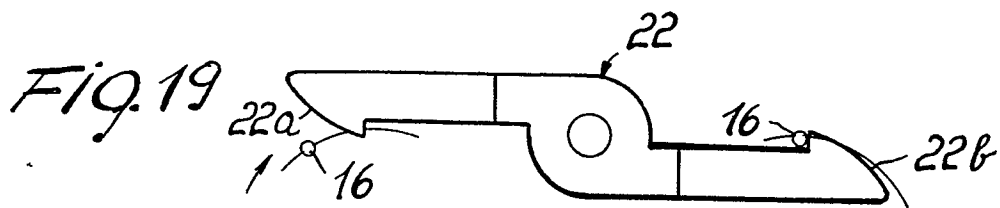


Fig. 19

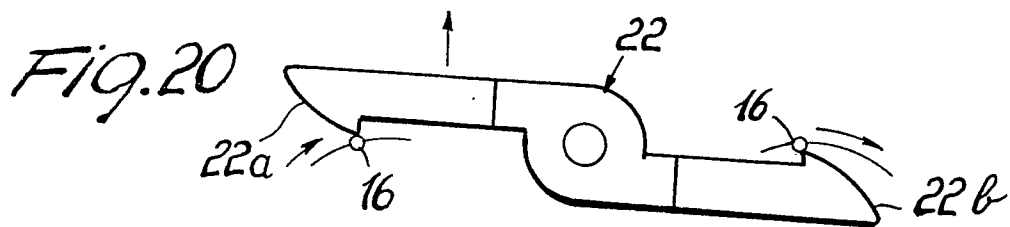


Fig. 20

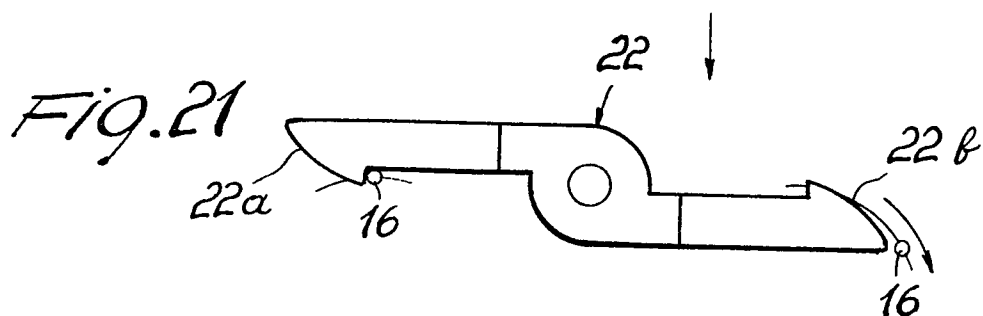


Fig. 21



European Patent
Office

EUROPEAN SEARCH REPORT

0082988

Application number

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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	US-A-3 535 893 (BOYER) *Column 4, line 5 - column 5, line 18; figures 1-7*	1	D 04 B 9/20
A	--- GB-A- 938 506 (FABRIQUE NATIONALE D'ARMES DE GUERRE)		
A	--- US-A-2 372 554 (COLE)		
A	--- DE-C- 454 962 (HILSCHER) -----		
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
			D 04 B
Place of search THE HAGUE		Date of completion of the search 05-04-1983	Examiner VAN GELDER P.A.
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