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(54) Device for scoring and fracturing ceramic tiles.

(57) The ceramic tile cutter is of the kind comprising at least a bridge guide, provided with device for weakly and heavily fastening the piece of tile to score and fracturing it, respectively, wherein the bridge guide (2) has fixed position at one end and is self adjusted at the other end. Such self adjusting is provided by a suitably shaped cam (40') engaging such bridge guide (2) with its operative contour, which is in the form of an exponential spiral defined by the following formula:

$$B_{1\ to\ n} = b X^{1\ to\ n} \text{ wherein } X = \sqrt[n]{B^{n/b}} \text{ and wherein:}$$

b = minimum resistance arm (to be established experimentally);
B_n = maximum weight arm (to be established experimentally);
n = number of (arbitrary) cam segments or α angle sections;
α = angle of amenability (to be established experimentally);
b; B_1; B_2; B_3;.....B_n = Arms of weight;
r; R_1; R_2; R_3;.....R_n = Points of weight.

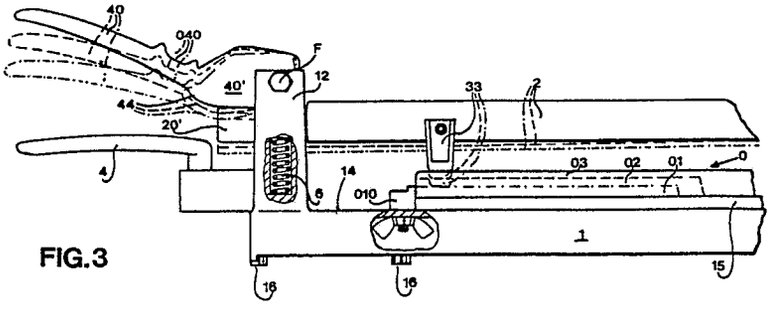

FIG.3

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Device for scoring and fracturing ceramic tiles.

The present invention relates to a device for scoring and fracturing ceramic tiles.

In the present state of the art, devices for scoring and fracturing ceramic tiles had been highly developed, either from the point of view of operation and of their manufacturing. Such developing, animated by competition, has abated the real cost and price of these devices particularly of those for amatorial and occasional use. Whereas, professional devices for scoring and fracturing ceramic tiles have been less influenced by this developing. Thus, professional devices, for scoring and fracturing ceramic tiles, were rather complex and expensive. It was also common opinion that such devices had reached a certain perfection, which could not be further improved. This is the case of the arrangement for weakly and heavily fastening the piece of tile to score and fracture, in consideration of its thickness which involved each time an adjustment thereof to the tile thickness of the tile. This was time consuming and the means to provide it rendered the tile cutter complicate and expensive Other particulars and characteristics thereof were objectionable, since the tile cutter was scarcely adapted to make particular and special tasks. In particular the press means were placed in the middle of bridge guide, i.e., in a critical point of the tile cutter thus requiring a strengthening and corresponding weight increase of the tile cutter.

The invention as claimed is intended to remedy these drawbacks. The inventor, with ingenious perception has conceived a series of arrangements which, from one side, maintain the professional level of the tile cutter, even increasing its adaptability in use and on the other hand such improvements are the result of simplifications involving an easier manufacturing technology and accommodation of loads. Such accommodation of loads favours a structure lightening which, at least at parity of other characteristics, results in a decrease of weight comprised between 30%, for models of smaller size to 50% for models of larger size Reduction substantially of the same order results in the manufacturing and sale cost. Original and radical improvements have been made to the self adjusting arrangement providing device for weakly and heavily fastening an fracturing of tile including a vertical fixed position of one end of the bridge guide.

Such self adjusting arrangement is provided by a suitably shaped cam, engaging such bridge guide with its operative contour, which is in the form of an exponential spiral, defined by the following formula:

$$B_{1\ to\ n} = bX^{1\ to\ n} \quad \text{wherein} \quad X = \sqrt[n]{B^{n/b}} \quad \text{and wherein:}$$

b = minimum resistance arm (to be established experimentally);
B_n = maximum weight arm (to be established experimentally);
n = number of (arbitrary) cam segments or α angle sections;
α = angle of amenability (to be established experimentally);
b; B_1; B_2; B_3;.....B_n = Arms of weight;
r; R_1; R_2; R_3;.....R_n = Points of weight.

A so profiled cam provide an easy and control over tiles of various thickness.

One way of carrying out the invention is described in detail below with reference to drawings which illustrate two specific embodiments, in which:

Figure 1 is a perspective view of device for scoring and fracturing ceramic tiles according to the present invention, of the kind comprising a scoring tool, pull operable in a direction converging towards the user. The condition of the device are with the bridge guide and consequently the driving handle completely lifted, to provide enough space thereunder to receive thickest tiles, as well as in the attitude for providing off set diagonal cuts, since a loose piece of the gauge shown in phantom lines, was removed and disposed in an appropriate receptacle, adapted also to receive the tools, such as the disk or cutter and the like.

Figure 2 is a perspective view of device for scoring and fracturing ceramic tiles, in accordance with the present invention, of the kind comprising a scoring tool, push operable in a direction diverging from the user. The condition of the device are while a possible user is scoring a tile by one hand, while, with the other hand, operates the handles to to seize the tile which is of regular thickness The loose piece for the off set diagonal cut, was removed to show the rear parts , and particularly the wedge of steel embodied in the upper wall of the base Some section lined parts, have been broken for clearness of drawings

Figure 3 is a detailed side view, of the user side of the device, comprising the driving handle and the fracturing arms; the driving handle, the bridge guide, the fracturing arms and the tile, are shown in different positions, distinguishable in view of the kind of the lines including them In this figure, the loose piece, to make an off set diagonal cut is applied. The attachment means are shown through a breaking.

Figure 4 is substantially a repetition of figure 2 but partially in a reduced scale and in the attitude while the user is providing the fracturing effort after scoring.

Figure 5 is a graph to design the curve of the cam, driven by the lever which provides either the function of first stage soft seizing, and the heavy grappling to provide fracturing The starting path includes the subdivision of the field and therefore of the curve in six segments or sections.

Referring now to the figures of the drawings, a device for scoring and fracturing ceramic tiles comprises, conventionally, a base 1, possibly embodying a graduated gauge bar 1′, from which project: at least a wedge 10 and a rib 10′, as well as two uprights 11, 11′; 12, placed at the ends thereof. On the end uprights 11, 11′; 12 is therebetween mounted a bridge guide 2, provided by two parallel rods 2′ and 2″, wherein a tool 3, is shiftably mounted therealong, a handle 3′, a follower 3″, in the form of handle-bar, a substantially rodlike body 30, and at the bottom thereof a disk or cutter 31. Fastened to the bridge guide 2, there is a pressure means 33, provided by a pair of fins 33′, 22″. An antagonist fixed handle 4 is attached to the base in line with the bridge guide 2 and projecting outwardly, therefrom. Substantially placed above to the fixed handle 4, there is a movable handle 40, which is swingable and cooperates with the bridge guide 2. On the upper surface 14, of the base 1, including the wedge 10 and the rib 10′, are fastened by adhesive, not shown, the resilient pads 15, 15′ of very soft material, to support and retain the tile, during scoring and fracturing. Under the base 1 and particularly from the bottom surface thereof, project three or more shoes 16, of resilient material, having a high adherence, such as rubber or the like.

According to the present invention, on the base 1, the graduated gauge 1′, is provided with at least section 010, which is removable, as a loose piece to be spoken hereunder. The base 1 is made of light alloy, obtained by a casting process and in it are embedded at least a wedge 10, made of very hard steel, as well as the bottom end 11′ of upright 11.

In accordance with an essential feature of the present invention, bridge guide 2, provided by two parallel rods 2′ and 2″, is pivotally mounted, with its end 20, to the upright 11, at the far end from the user, while the end 20′, adjacent to the user is urged upward by a spring 6 and may be forced downward by a cam 40′, including a lever 40, swingably mounted on the upright 12. Its position is such that a cam swinging covers a complete thickness range of the tiles (0, 01, 02, 03) as needed by the cutter user, i.e. from mm 4 to mm 20,.is obtained Since the resistance opposed to fracturing by the tile varies substantially with cube of thickness, the cam 40′ is shaped with a profile 44 in the form a logarithmic spiral (figure 5). From figure 5 and in part from figure 3 it may be seen that for designing the cam operative profile, which is in the form of an exponential spiral, the following formula can be used:

$$B_{1\ to\ n} = bX^{1\ to\ n} \text{ wherein } X = \sqrt[n]{B^{n/b}} \text{ and wherein:}$$

b = minimum resistance arm (to be established experimentally);
$\mathbf{B_n}$ = maximum weight arm (to be established experimentally);
n = number of (arbitrary) cam segments or α angle sections;
α = angle of amenability (to be established experimentally);
b; B_1; B_2; B_3;.....B_n = Arms of weight;
r; R_1; R_2; R_3;.....R_n = Points of weight.

Arguments b; Bn; are established experimentally and n is established arbitrarily, in this case as 6; α angle is split into six sections and on each of them is entered respectively, the arm, B which is analytically calculated by said formula. In consideration that the profile of cam may be 8 cm of length, the sixth root of 8 returns 1,4142....

Now a short description of operation of the tile cutter will be given. The tile cutter is placed, generally on the floor, so that the feet 16 adhere to the same, possibly without wasting it. In stationary condition (figure 1) the bridge guide 2 and, consequently the driving handle 40 are completely lifted, to provide enough space thereunder to receive tiles 0 of highest thickness (figure 3), and in particular under the press arms of fins 33′, 33″ or between the same and wedge 10. At this stage, a tile 0, which may be a thin one, 01, e.g. of 4 mm, as shown in phantom lines.is accommodated in such interstice. Swinging downward the handle 40, in an anticlockwise direction, the bridge guide 2, as well as the press arm 33′, 33″, engaging

such thin line, assume a position also indicated in phantom lines in figure 3. With thicker tiles 02, 03, e.g. of mm 10 and 20, different corresponding, positions apply which are indicated, as dashed and continuous lines, respectively. However, as already explained, the range of swinging of the lever 40 is contained within the grasping limits of the seizer's hand acting between the handle 40 itself and the fixed handle 4. Once the press arms engage the tile or provide such engagement, the thumb 00 of the user's hand engages, the seat or indent 040, which is rather close to its fulcrum F. Thus it operates with a relatively reduced arm providing a wanted, drastic, reduced advantage obtained with the handle 40; this avoids anticipated heavy stress of the tiles (0, 01, 02, 03) which could accidentally break it. Whereas, such heavy stress is necessary, after scoring for fracturing the tile 02 (figure 4).and this may be obtained maximizing the power arm, i.e., engaging the handles 4 and 40 at their outer ends. A this stage if the tile cutter, in accordance with the present invention, is provided with a push scoring tool 03′ (figure 2) the latter is operated in a direction diverging, from the user, whereby to score the tile 02; this is made with one hand, while through the other hand, as aforesaid, the tile 02 is seized. The reaction of the operating pushing force, tending to displace the cutter from its proper position is counteracted in part by adherence of feet 16 over the supporting surface and in part acting with the thumb 00 within the indent 040. This management and distribution of the force to be provided is advantageous in providing a perfect scoring, even to reduce the fracturing force (figure 4).

According to a preferred embodiment of the present invention, for offset diagonal cut to accommodate the tiles (0, 01, 02, 03) to be cut, removal of a loose piece 010 of the gauge 1′, to register the tile 0.in suitable position, is provided.

In accordance with another embodiment of the present invention the tile cutter is provided with a receptacle 7, including a lid 7′, to receive the loose piece 010, as well as disks or cutters 31′ and the like (figure 1).

In case that the cutter, as shown in figure, 1 is provided with a pull driven tool 3 the force may be even better controlled avoiding overload on the handle 40 which could break the tile 0.

Claims

1. Device for scoring and fracturing ceramic tiles, of the kind comprising at least a bridge guide (2), provided with device for weakly and heavily fastening the piece of tile (0) to score and fracturing it, respectively, characterized in that the bridge guide (2) has fixed vertical position at one end (20) thereof and is provided with a self adjusting arrangement (F, 40, 40′, 040) at the other end (20′) of same.

2. Device for scoring and fracturing ceramic tiles, as claimed in claim 1, characterized in that such self adjusting arrangement (F, 40, 40′, 040) is provided by a suitably shaped cam (40′, 44) engaging, at least at one end (20′), such bridge guide (2) with its operative contour (44), which is in the form of an exponential spiral defined by the following formula:

$$B_{1\ to\ n} = bX^{1\ to\ n} \text{ wherein } X = \sqrt[n]{B^{n/b}} \text{ and wherein:}$$

b = minimum resistance arm (to be established experimentally);
B_n = maximum weight arm (to be established experimentally);
n = number of (arbitrary) cam segments or α angle sections;
α = angle of amenability (to be established experimentally);
b; B_1; B_2; B_3;.....B_n = Arms of weight;
r; R_1; R_2; R_3;.....R_n = Points of weight

3. Device for scoring and fracturing ceramic tiles, as claimed in claims 1 and 2, characterized in that the handle (40) is anatomically shaped, whereby the user can better control the force to be ergonomically provided with both hands.

4. Device for scoring and fracturing ceramic tiles, as claimed in claims from 1 to 3, characterized in that the press arms or fins (33′, 33″) are fixed to the bridge guide (2) whereby to minimize the load and manual power, as well as its cost.

5. Device for scoring and fracturing ceramic tiles, as claimed in preceding claims, including a substantially known gauge bar arrangement (1′), characterized in that a loose piece (010) is provided whereby the tile (0, 01, 02, 03), may be positioned for offset diagonal cuts.

6. Device for scoring and fracturing ceramic tiles, as claimed in preceding claims, characterized in that the table receiving the tile (0, 01, 02, 03) to be cut is provided by a pair of pads or mats (15, 15′) which are sticked on the upper surface (14) of the base (1).

7. Device for scoring and fracturing ceramic tiles, as claimed in preceding claims, characterized in that the scoring arrangement (3, 3′, 3″ 30, 31) is potentiated for push or pull driving or alternately in either directions whereby to provide a definite scoring.

8. Device for scoring and fracturing ceramic tiles, as claimed in preceding claims, characterized in that the tile cutter embodying the device is provided with a receptacle (7), including a lid (7′), to receive the loose piece (010), as well as disks or cutters (31′) and the like (figure 1)

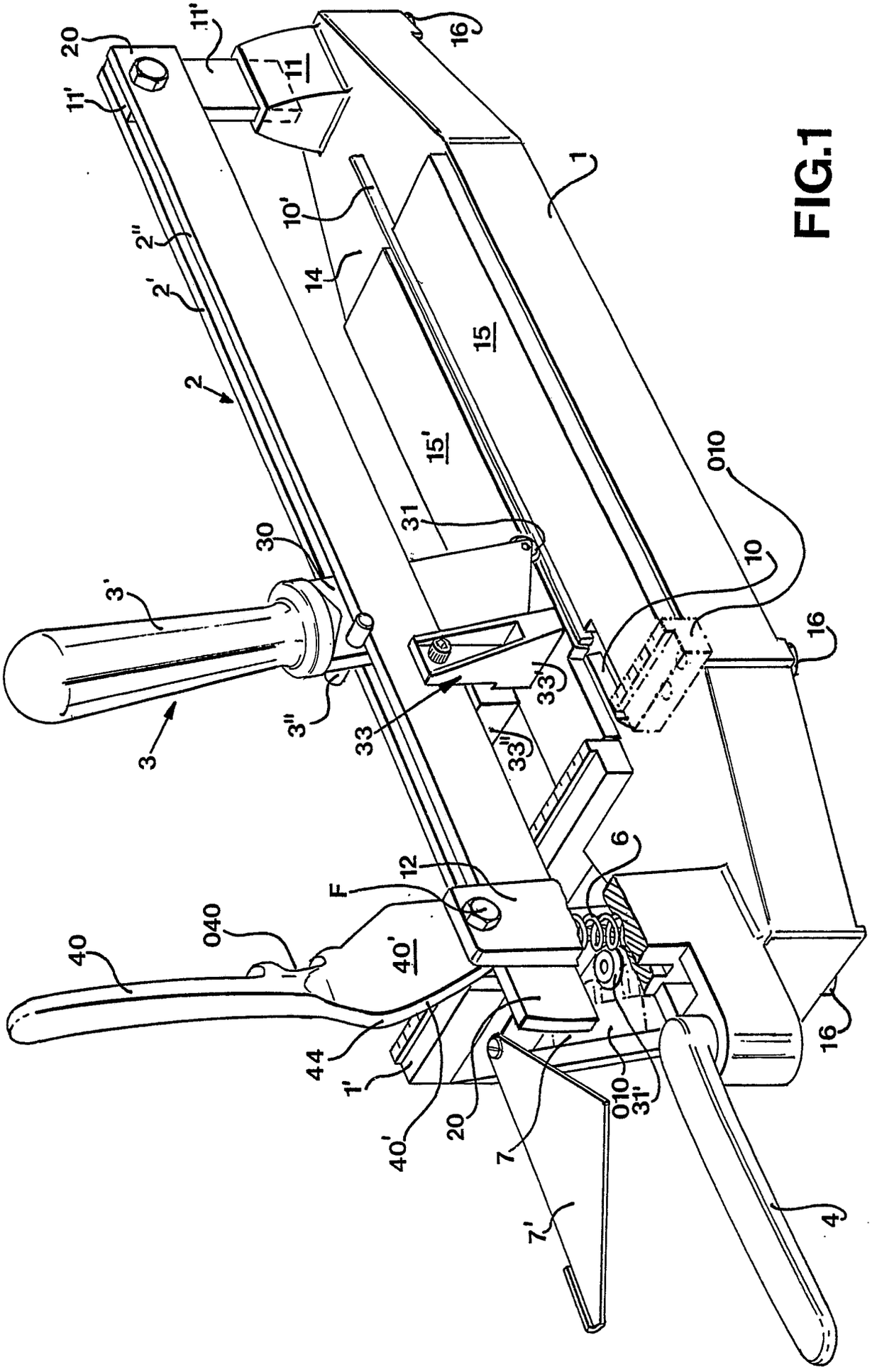
20
11'
11
16
10'
1
2"
2'
14
15
2
15'
010
31
30
10
3'
16
33'
3"
33
33"
3
6
12
F
040
40
40'
44
1'
20
7
7'
010
31'
16
4

FIG.1

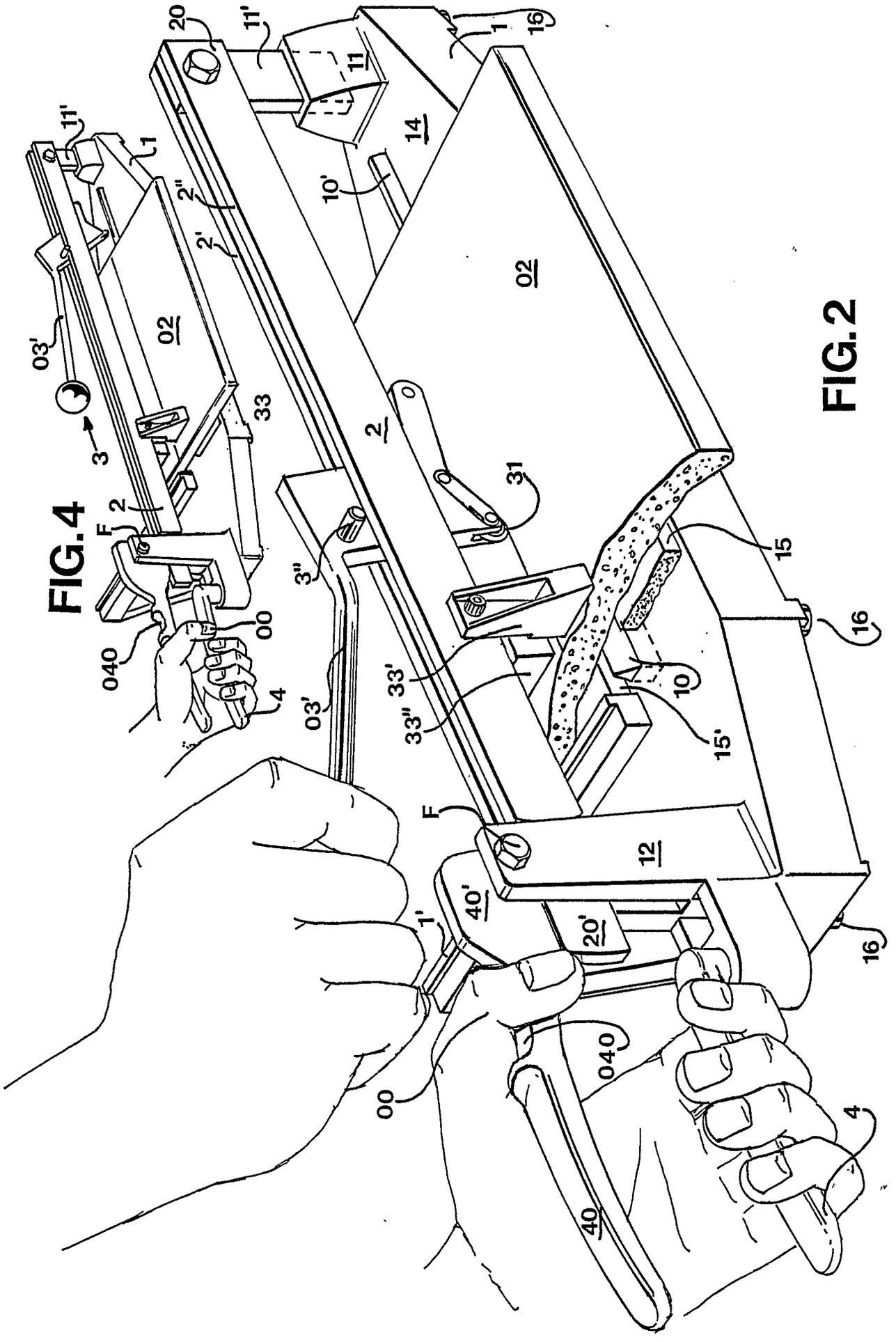
20
11'
1
16
11
14
10'
2"
2'
02
03'
3
33
2
31
3"
F
2
040
00
4
03'
33'
33"
15
16
10
15'
12
40'
1'
20'
16
040
00
4
40

FIG.4

FIG.2

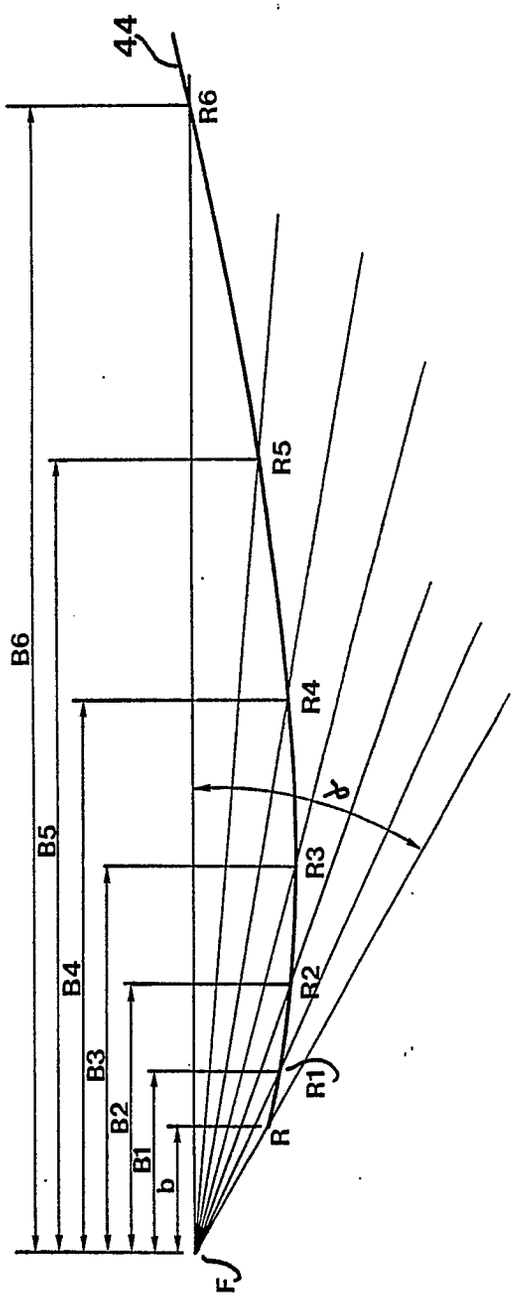
44
R6
R5
R4
R3
R2
R1
R
B6
B5
B4
B3
B2
B1
b
γ
F

FIG.5

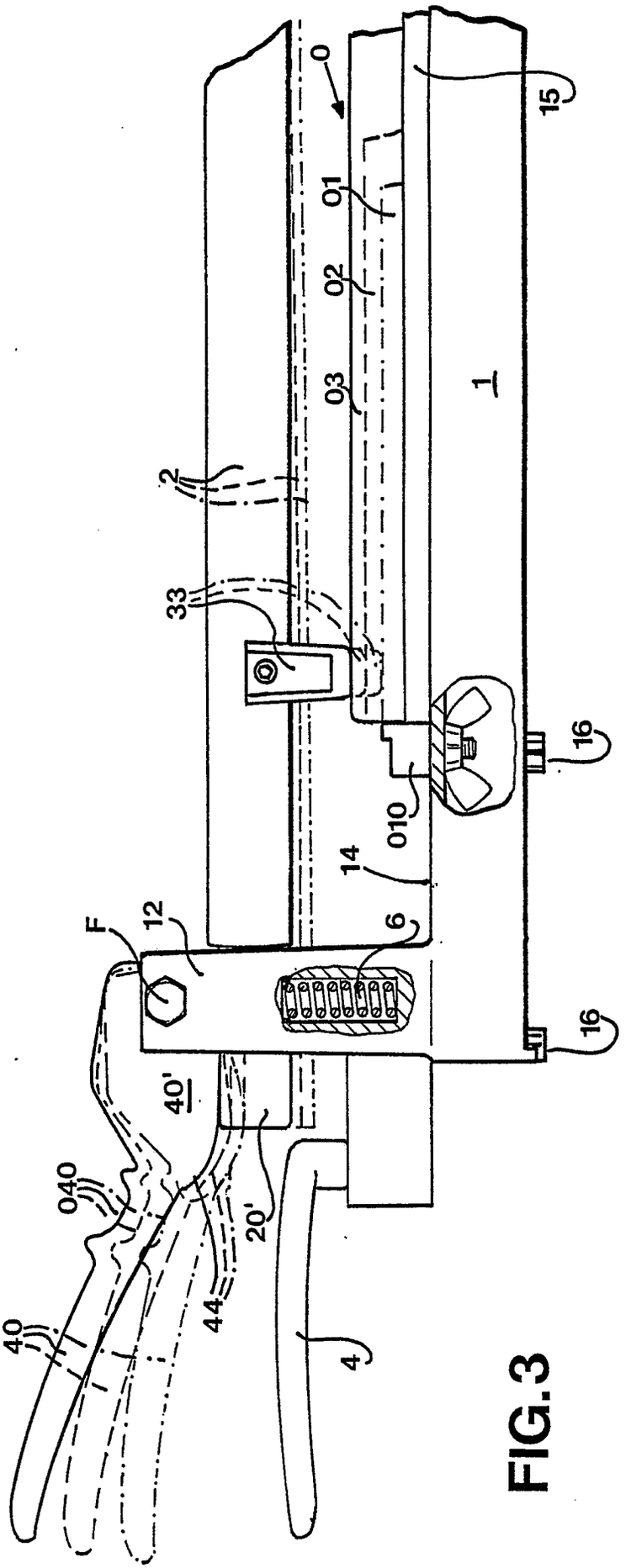
0
01
02
03
1
15
2
33
16
010
14
6
F
12
16
40'
040
20'
44
40
4

FIG.3

European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 88111376.5

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 4)
X	GB - A - 2 021 036 (RAIMONDI) * Page 1, lines 90-99 *	1,3,4	B 28 D 1/22
Y		2	
Y	US - A - 1 297 539 (BULL) * Fig. 1 *	2	
A	DE - A - 1 652 521 (THANING) * Fig. 1 *	1	
A	US - A - 4 378 782 (RICHARD SCHOTTER) * Fig. 4 *	6	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

B 25 B
B 28 D
F 16 B
F 16 H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	05-10-1988	GLAUNACH

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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