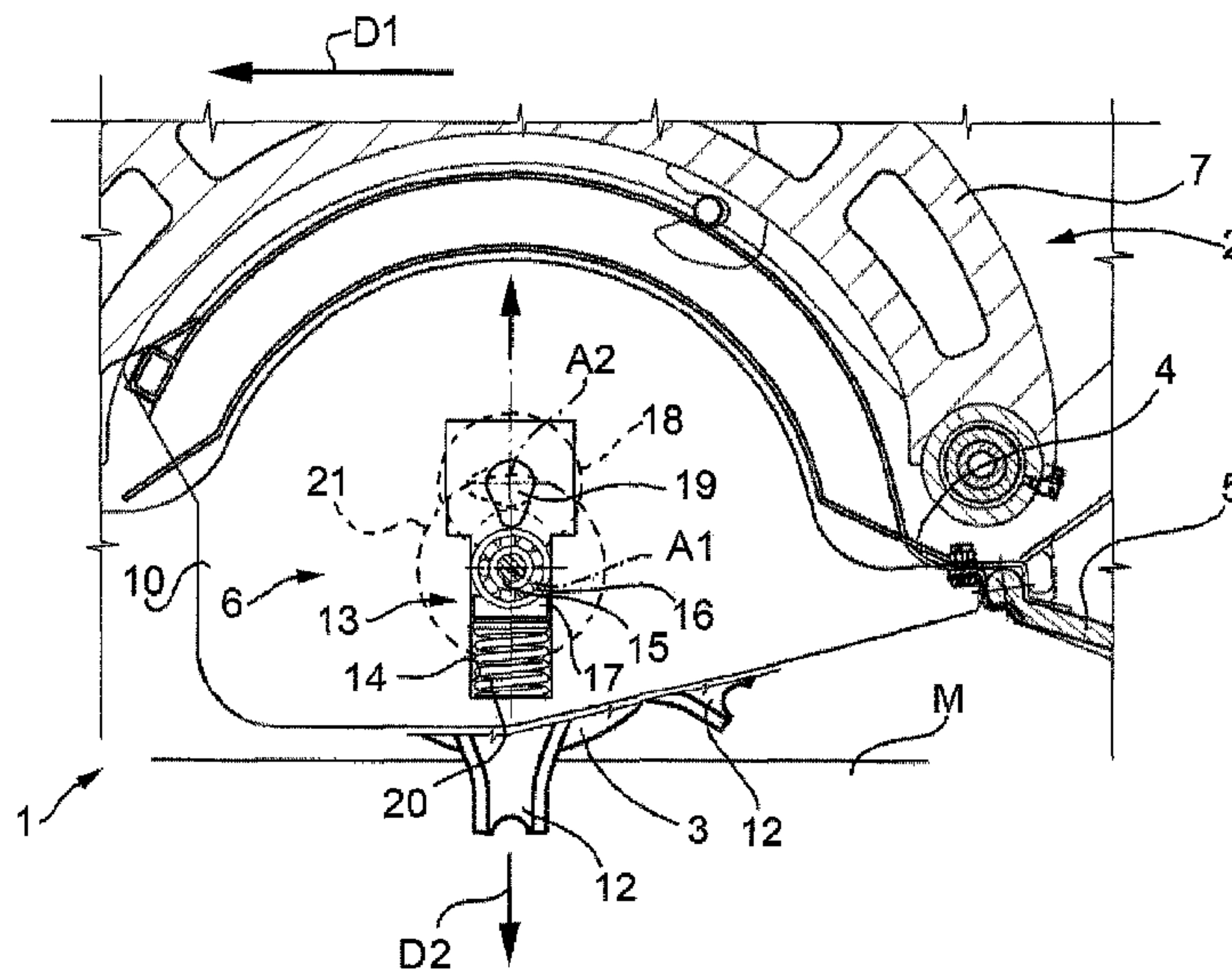




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(54) Titre : FRAISE A NEIGE ROTATIVE ET PROCEDE DE DAMAGE DE PISTE DE SKI
(54) Title: ROTARY SNOW TILLER AND SKI SLOPE GROOMING METHOD



(57) **Abrégé/Abstract:**

A rotary snow tiller (1), for grooming the snow covering (M) of ski slopes, which advances in a travelling direction (D1) along the ski slope, and has a frame (2); a shaft (3) fitted with teeth (12) and rotated with respect to the frame (2) about an axis (A1) crosswise to the travelling direction (D1); and an actuating device (6) for imparting a reciprocating movement to the shaft (3) with respect to the frame (2).

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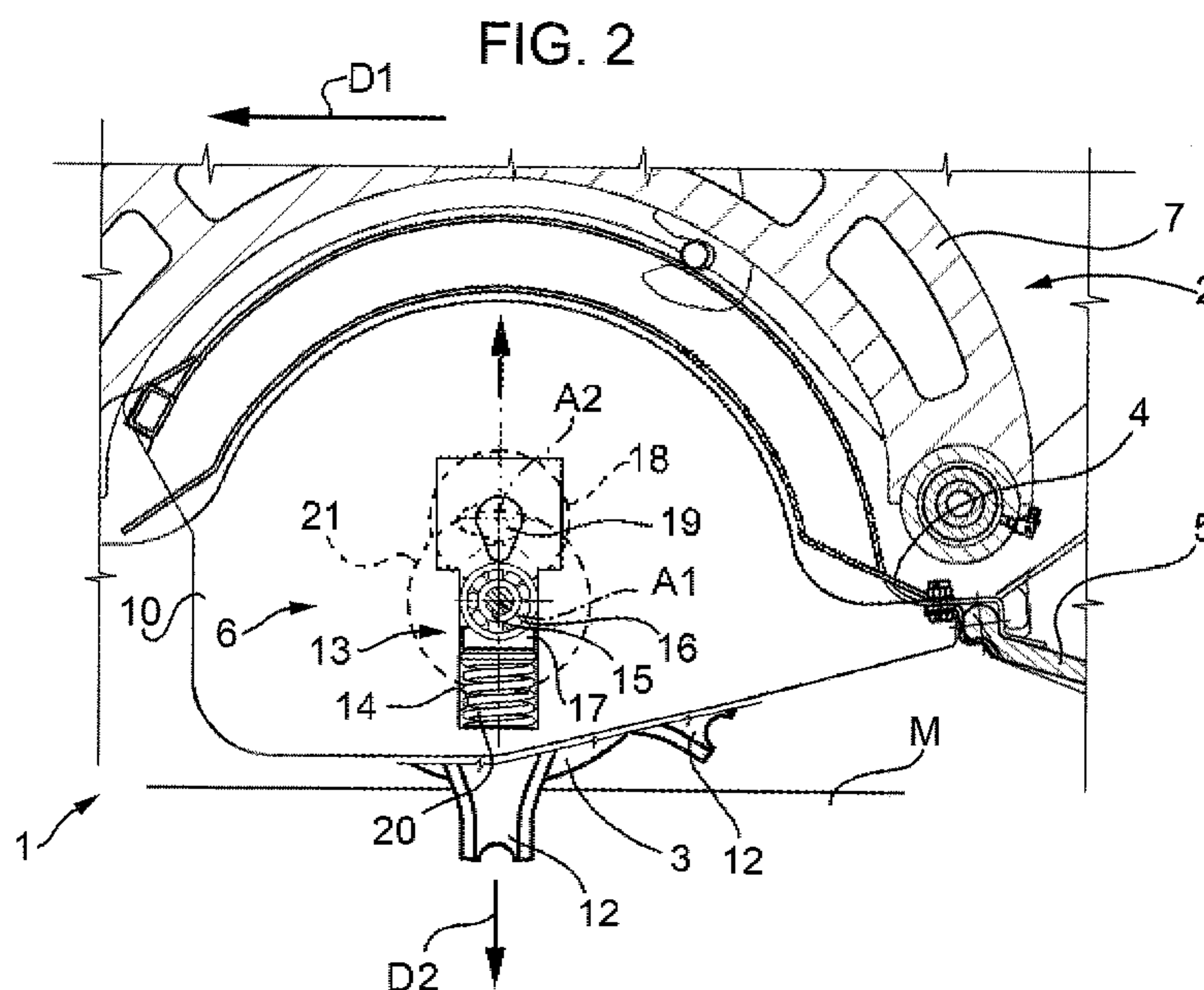
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(54) Title: ROTARY SNOW TILLER AND SKI SLOPE GROOMING METHOD



(57) Abstract: A rotary snow tiller (1), for grooming the snow covering (M) of ski slopes, which advances in a travelling direction (D1) along the ski slope, and has a frame (2); a shaft (3) fitted with teeth (12) and rotated with respect to the frame (2) about an axis (A1) crosswise to the travelling direction (D1); and an actuating device (6) for imparting a reciprocating movement to the shaft (3) with respect to the frame (2).

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ROTARY SNOW TILLER AND SKI SLOPE GROOMING METHOD

TECHNICAL FIELD

The present invention relates to a rotary snow
5 tiller for grooming ski slopes.

BACKGROUND ART

A rotary snow tiller for grooming ski slopes
normally advances in a travelling direction along the
ski slope, and comprises a frame; and a toothed shaft
10 rotated with respect to the frame about an axis
crosswise to the travelling direction.

Known rotary snow tillers of the above type have
proved particularly effective in grooming ski slopes.
The snow covering, however, varies considerably with
15 weather conditions, snowfall and, particularly, daily
variations in temperature. In the case of a steep
temperature swing on either side of zero degrees, the
snow covering forms an icy surface crust which, when
particularly thick, impairs performance, in terms of
20 quality grooming, of known rotary snow tillers.

DISCLOSURE OF INVENTION

It is an object of the present invention to provide
a rotary snow tiller for grooming ski slopes, designed
to eliminate the drawbacks of the known art in a
25 straightforward, low-cost manner, and in particular to
effectively groom icy snow coverings.

According to the present invention, there is
provided a rotary snow tiller, for grooming the snow

covering of ski slopes, which advances in a travelling direction along the ski slope, and comprises a frame; and a shaft fitted with teeth and rotated with respect to the frame about an axis crosswise to the travelling direction; the rotary snow tiller being characterized by comprising an actuating device for imparting a reciprocating movement to the shaft with respect to the frame.

According to the present invention, the icy snow covering is broken up not only by conventional tilling action, but also by vibration of the teeth which interact with the icy snow covering as they sink into it.

The present invention also relates to a ski slope snow grooming method.

According to the present invention, there is provided a method of grooming the snow covering of ski slopes; the method comprising the step of tilling the snow covering using a rotary snow tiller advanced in a travelling direction and comprising a frame, and a shaft fitted with teeth and rotated about an axis; the method also comprising imparting a reciprocating movement to said shaft with respect to the frame.

BRIEF DESCRIPTION OF THE DRAWINGS

A number of non-limiting embodiments of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a side view, with parts removed for

clarity, of a rotary snow tiller for grooming ski slopes, in accordance with the present invention;

Figure 2 shows a partly sectioned side view, with parts removed for clarity, of a detail of the Figure 1 rotary snow tiller;

Figure 3 shows a schematic, partly sectioned front view, with parts removed for clarity, of a detail of the Figure 2 rotary snow tiller;

Figure 4 shows a partly sectioned side view, with parts removed for clarity, of a variation of the Figure 2 rotary snow tiller;

Figure 5 shows a schematic, partly sectioned front view, with parts removed for clarity, of a detail of the Figure 4 rotary snow tiller.

BEST MODE FOR CARRYING OUT THE INVENTION

Number 1 in Figure 1 indicates as a whole a rotary snow tiller for grooming the snow covering M of ski slopes, and which is towed in a travelling direction D1 by a snow groomer vehicle not shown in the drawings.

Rotary snow tiller 1 is designed to till a surface layer of snow covering M, and comprises a frame 2; a shaft 3 rotated with respect to frame 2 about an axis A1 crosswise to travelling direction D1; a protective casing 4 surrounding shaft 3 rotating about axis A1 crosswise to travelling direction D1; a normally flexible finish mat 5 which is connected to casing 4, extends behind shaft 3, and is drawn over the surface of the tilled snow covering M; and an actuating device 6

(Figures 2 and 3) located between shaft 3 and frame 2 to impart a reciprocating movement to shaft 3.

Frame 2 comprises a bar 7 parallel to axis A1; a hitch device 8 fixed to bar 7 and for connecting tiller
5 1 to the snow groomer vehicle (not shown); two arc-shaped segments 9 (only one shown) fixed transversely to bar 7; and two plates 10 (only one shown in Figure 1) for supporting shaft 3.

Rotary snow tiller 1 comprises two adjustable
10 panels 11 (only one shown in Figure 1) which act to a certain extent as splash guards to protect casing 4 and finish mat 5 from the snow thrown up by the groomer vehicle not shown in the drawings.

Shaft 3 comprises a number of teeth 12 equally
15 spaced about and along axis A1, and each of which projects radially from shaft 3 to penetrate snow covering M.

The length of shaft 3 defines the work range and the width of tiller 1 as a whole.

20 With reference to Figures 2 and 3, rotary snow tiller 1 comprises a guide assembly 13 for guiding shaft 3 in a direction D2 crosswise to travelling direction D1 and to axis A1 of shaft 3, and which comprises two guides 14 (only one shown in Figure 2) integral with
25 frame 2. In the Figure 2 and 3 example, guides 14 are two grooves formed in plates 10. Shaft 3 comprises two ends 15 - in the example shown, two end pins - which slide inside respective grooves 14 in direction D2.

More specifically, and with reference to Figure 3, guide assembly 13 comprises two bearings 16 fitted to respective ends 15 of shaft 3; and two slides 17, each fitted in sliding manner to a respective guide 14 and in
5 rotary manner to a respective end 15 of shaft 3.

Actuating device 6 comprises a rotary actuator 18 associated with frame 2 and connected to a respective end 15 of shaft 3 by a mechanism 19, which, in the example shown, is defined by a cam supported by a
10 respective plate 10 to rotate about an axis A2 parallel to axis A1; and an elastic member 20 located between frame 2 and end 15 of shaft 3, and which, in the example shown, is a spring, in particular a coil spring, for pushing slide 17, bearing 16, and end 15 of shaft 3
15 against mechanism 19.

Figure 3 shows two actuating devices, which are operated synchronously, and each of which is located at a respective end of the shaft.

One end 15 of shaft 3 is connected to a hydraulic
20 motor 21 for rotating shaft 3 about axis A1.

In actual use, rotary snow tiller 1 is drawn along the ski slope in travelling direction D1 by a snowgroomer vehicle (not shown) to till snow covering M. Shaft 3 is rotated, preferably anticlockwise in Figure
25 1, about axis A1 by hydraulic motor 21 to till snow covering M, which is then smoothed by finish mat 5. In addition to rotating about axis A1, shaft 3 is selectively moved back and forth in direction D2,

crosswise to travelling direction D1 and to axis A1, by actuating devices 6.

Teeth 12 of shaft 3 thus rotate and also perform a reciprocating movement which allows teeth 12 to break
5 easily through the icy crust and effectively till snow covering M.

More specifically, mechanisms 19, i.e. the cams, are rotated synchronously about axes A2 to impart a reciprocating movement to shaft 3.

10 Alternatively, the movement in direction D2 is imparted by a single rotary actuator connected to both ends of the shaft by a mechanical transmission.

In the Figure 4 and 5 variation, actuating devices 6 are replaced by an actuating device 22, which imparts
15 a reciprocating movement to shaft 3 in a direction D3 substantially parallel to axis A1 of shaft 3.

Accordingly, each supporting plate 10 is replaced by a supporting plate 23, which comprises a portion 24 integral with frame 2; and a portion 25 movable with
20 respect to frame 2 and connected to portion 24 by elastic anchors 26, each of which is connected to portion 24 and portion 25 by respective brackets. Each portion 25 is connected to a respective end 15 of shaft 3, possibly by means of bearings not shown in Figures 4
25 and 5.

Actuating device 22 comprises a bracket 27 fixed to portion 24 and extending along portion 25; a mechanism 28 defined, in the example shown, by a cam rotated about

an axis A3 crosswise to axis A1; and a rotary actuator 29 defined, in the example shown, by a hydraulic actuator for operating mechanism 29.

Rotation of mechanism 28 about axis A3 produces a
5 reciprocating movement of shaft 3 substantially in direction D3 parallel to axis A1.

In a variation not shown, rotary snow tiller 1 comprises two actuating devices 22 located at two opposite plates 23 and synchronized to produce a
10 reciprocating movement of shaft 3 in direction D3.

CLAIMS

What is claimed is:

1. A snow grooming rotary snow tiller comprising:
 - a frame;
 - a shaft supported by the frame, said shaft fitted with a plurality of teeth and configured to rotate about a first axis crosswise to a direction that the frame is configured to travel along a ski slope; and
 - an actuating device including at least a first rotary actuator fixed to the frame and connected to the shaft by a rotary cam, said actuating device configured to impart a reciprocating movement to the shaft with respect to the frame.
2. The snow grooming rotary snow tiller of claim 1, which includes:
 - two bearings, each bearing fitted to an opposite end of the shaft; and
 - two slides, each slide connected to a respective one of the bearings and slideably connected to a respective guide.
3. The snow grooming rotary snow tiller of claim 1, which includes a plurality of elastic members located between the frame and the shaft, said elastic members being configured to push the shaft against the rotary cam.
4. The snow grooming rotary snow tiller of claim 1, which includes a guide assembly configured to guide the shaft with respect to the frame in a direction perpendicular to the direction that the frame is configured to travel and perpendicular to the first axis.
5. The snow grooming rotary snow tiller of claim 4, wherein the guide assembly includes two guides connected to the frame and two ends of the shaft are each slidably connected to one of the respective guides.
6. The snow grooming rotary snow tiller of claim 1, which includes a plurality of actuating devices, at least one of the actuating devices fitted to each respective end of the shaft.
7. The snow grooming rotary snow tiller of claim 1, wherein the shaft is moveably

connected to the frame in a direction substantially parallel to the first axis and said actuating device is configured to impart the reciprocating movement in a direction parallel to the first axis.

8. A snow grooming rotary snow tiller comprising:

a frame;

a shaft supported by the frame, said shaft fitted with a plurality of teeth and configured to rotate about a first axis; and

an actuating device including at least a first rotary actuator fixed to the frame and connected to the shaft by a rotary cam, said actuating device configured to cause the shaft to move toward and away from a top of the frame.

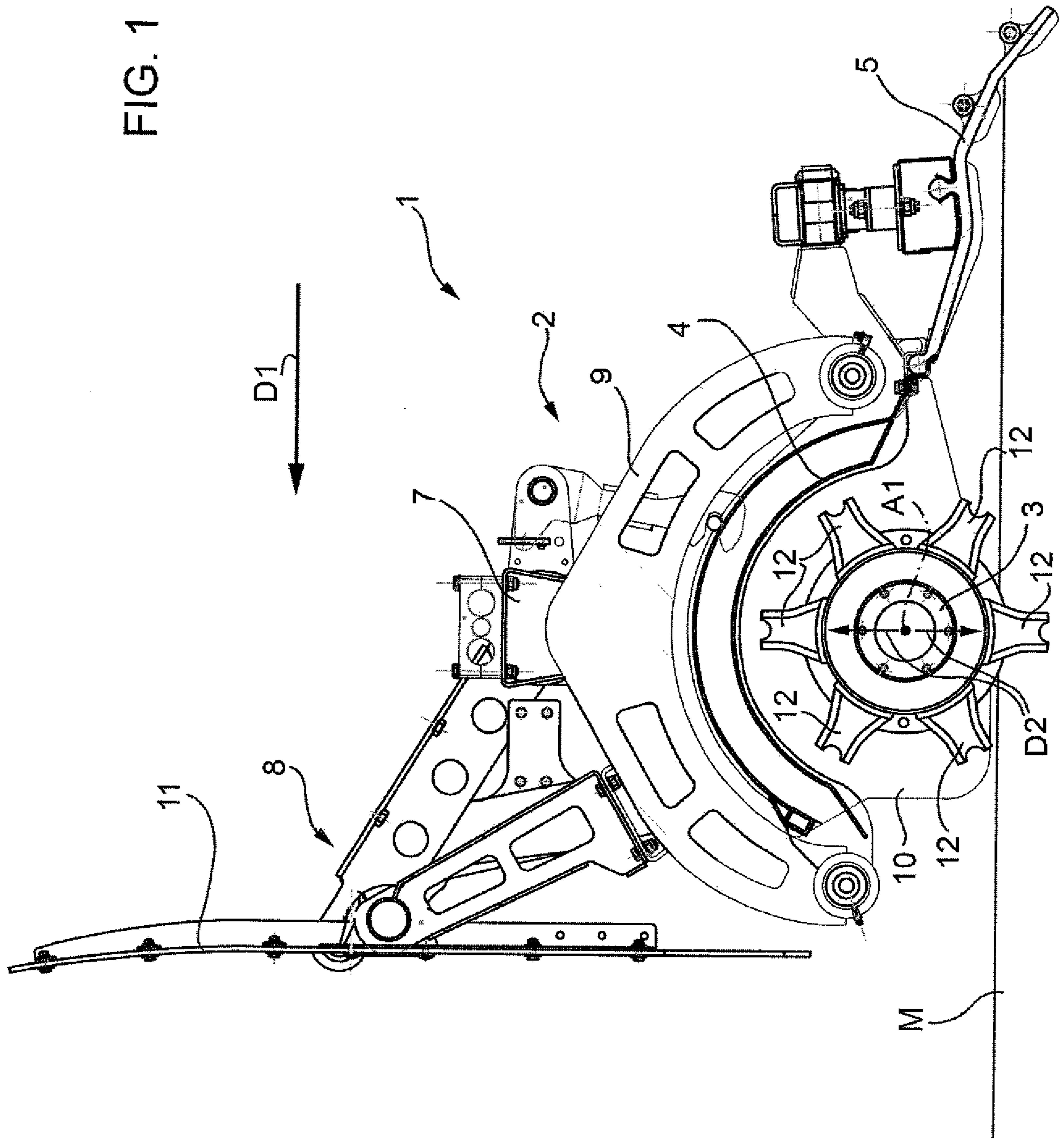
9. The snow grooming rotary snow tiller of claim 8, which includes:

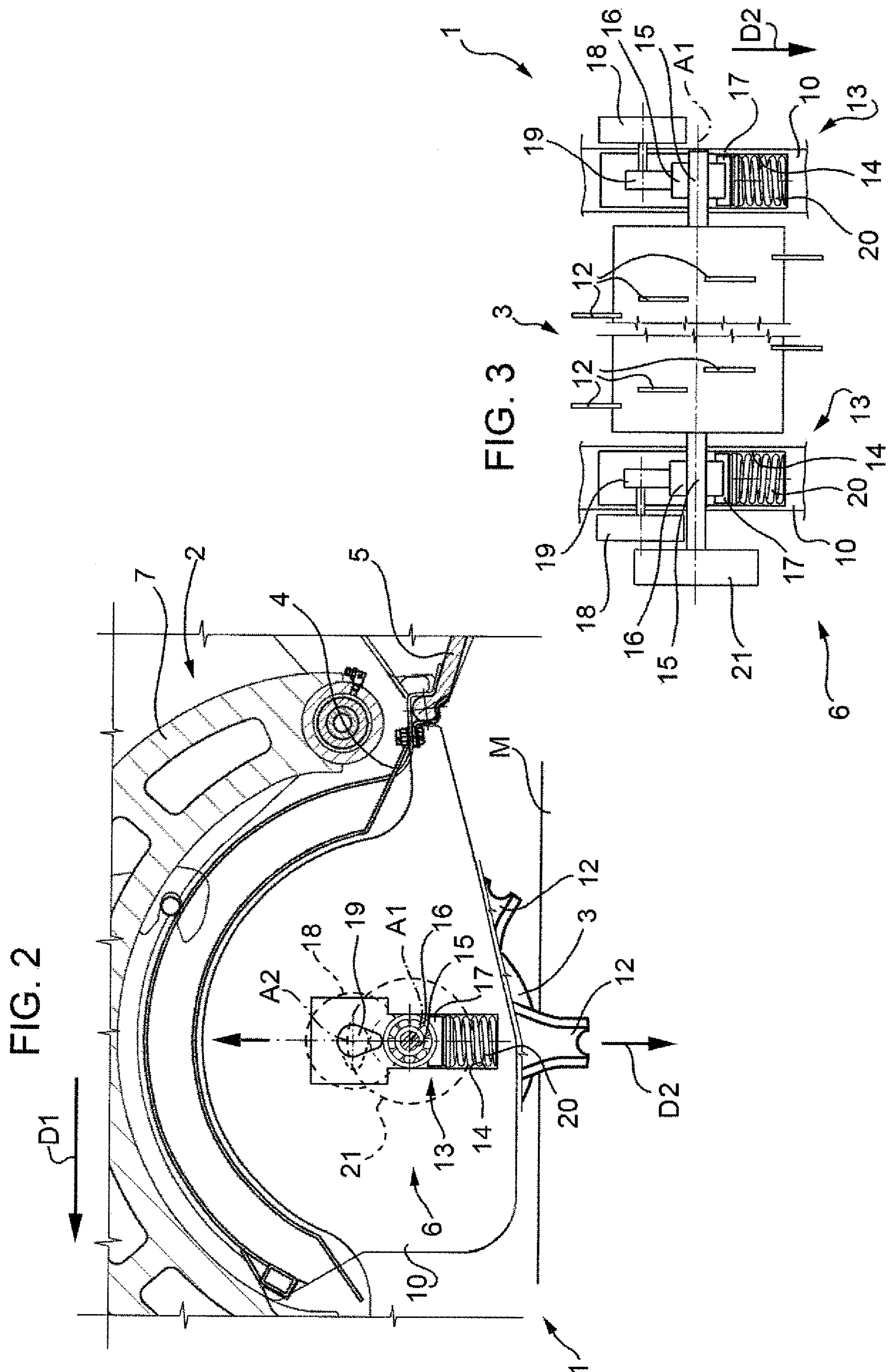
two bearings, each bearing fitted to an opposite end of the shaft; and

two slides, each slide connected to a respective one of the bearings and slideably connected to a respective guide.

10. The snow grooming rotary snow tiller of claim 8, which includes a plurality of elastic members located between the frame and the shaft, said elastic members being configured to push the shaft against the rotary cam.

11. The snow grooming rotary snow tiller of claim 8, which includes a plurality of actuating devices, at least one of the actuating devices fitted to each respective end of the shaft.





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FIG. 4

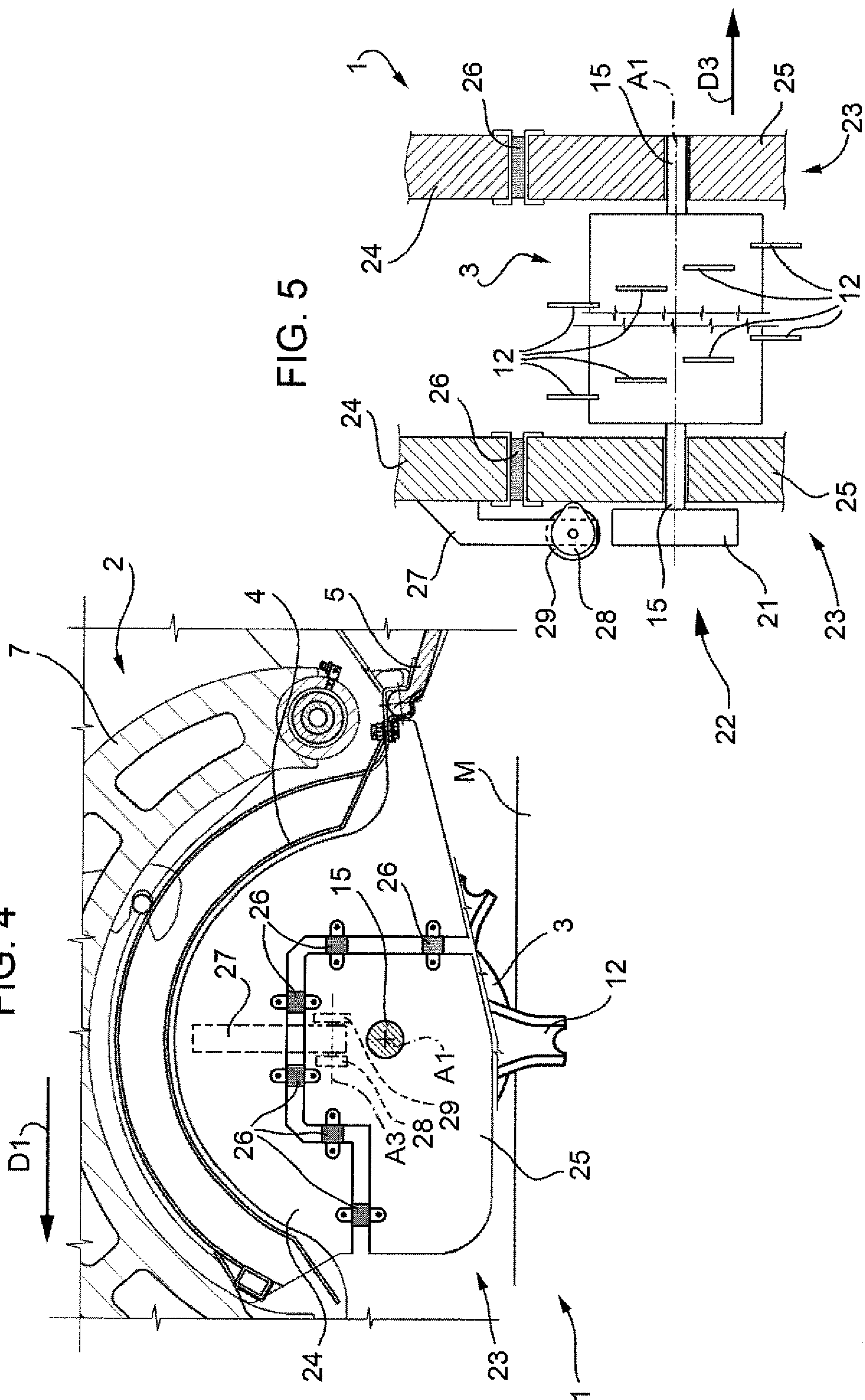


FIG. 5

