United States Patent [19]

Norris et al.

[11] **3,789,551**

[45] **Feb. 5, 1974**

[54] **SKATE SHARPENING DEVICES**

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[22] Filed: **Feb. 28, 1972**

[21] Appl. No.: **229,700**

[52] **U.S. Cl.** ..... **51/92 R**, 51/100 R, 51/228, 51/281 R

[51] **Int. Cl.** **B24b 1/00**, B24b 9/04

[58] **Field of Search** . 51/228, 224, 231, 281 R, 285, 51/92 R, 92 BS, 92 HK, 100 R, 102, 92 ND

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[57] **ABSTRACT**

A device to establish and control the desired longitudinal contour of an ice skating blade during sharpening thereof. Included is a skate blade holder which is mounted for movement on a carriage such that the holder follows an arcuate template as it is moved past a rotary grinder. An indexing mechanism is provided for adjusting the position of the skate blade on the holder such that a predetermined ice tangency point may be established on the blade.

8 Claims, 8 Drawing Figures

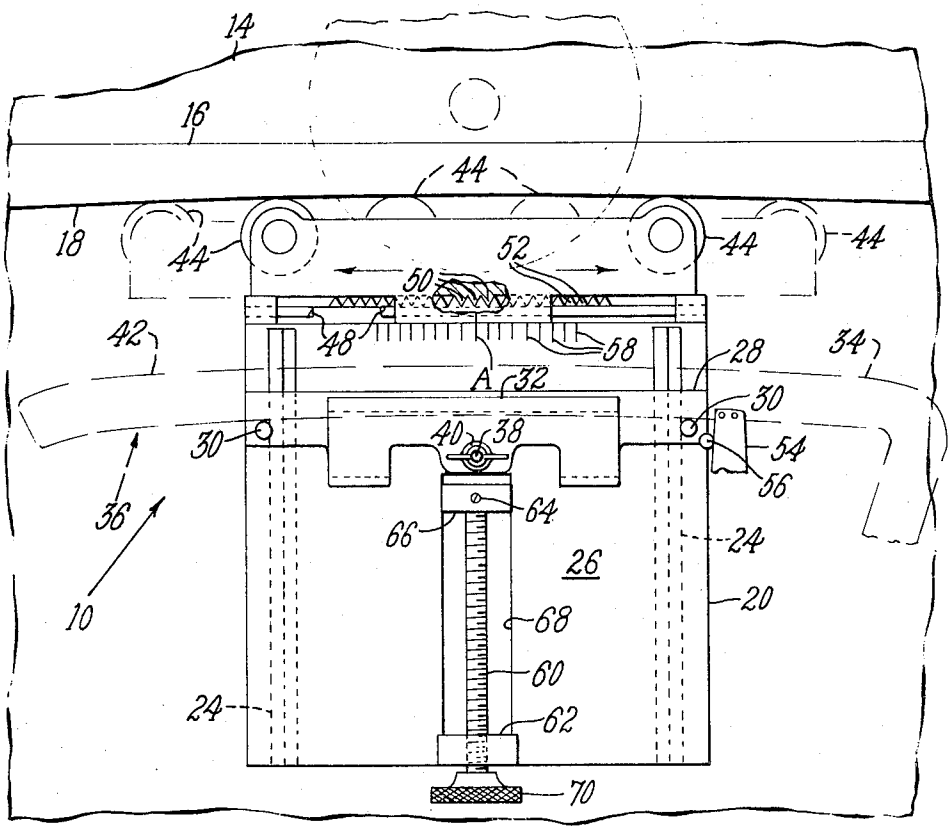

Fig. 1

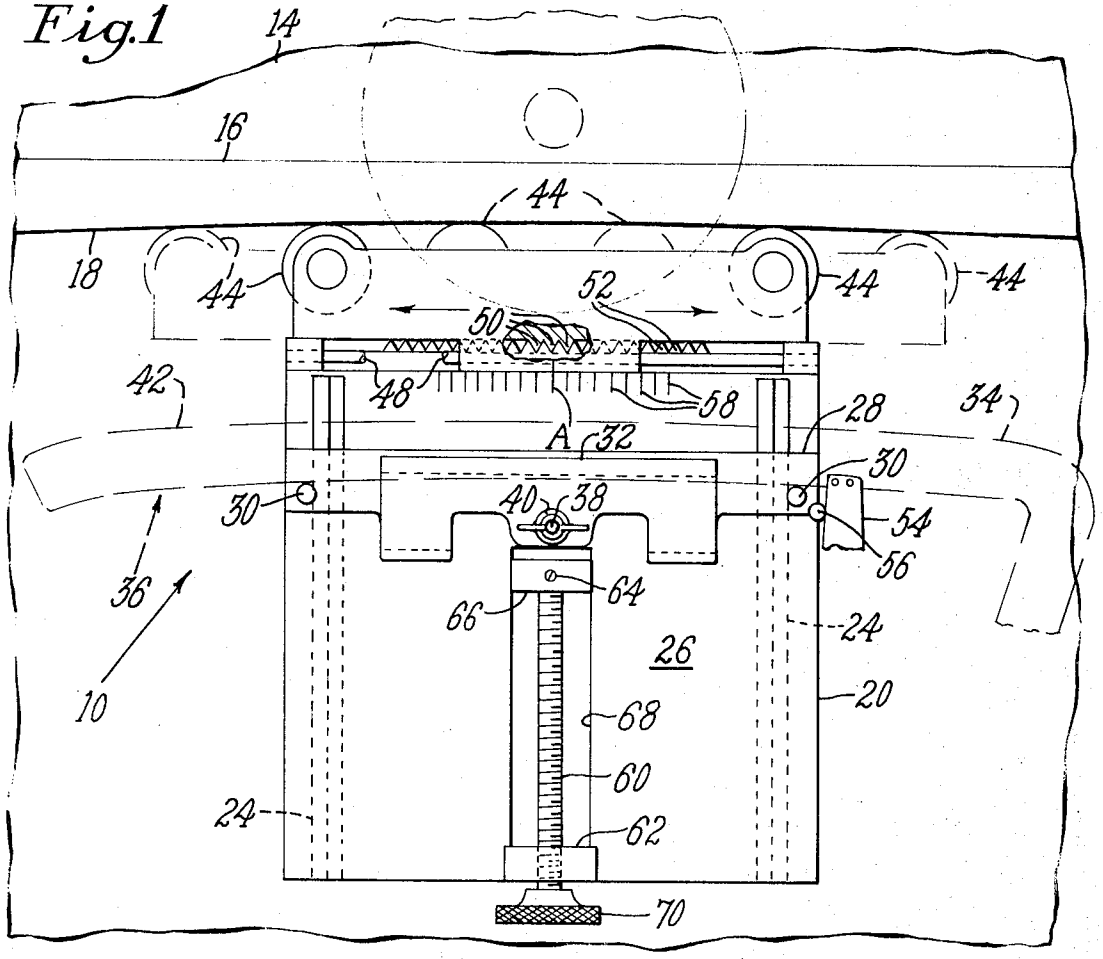
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Fig. 2

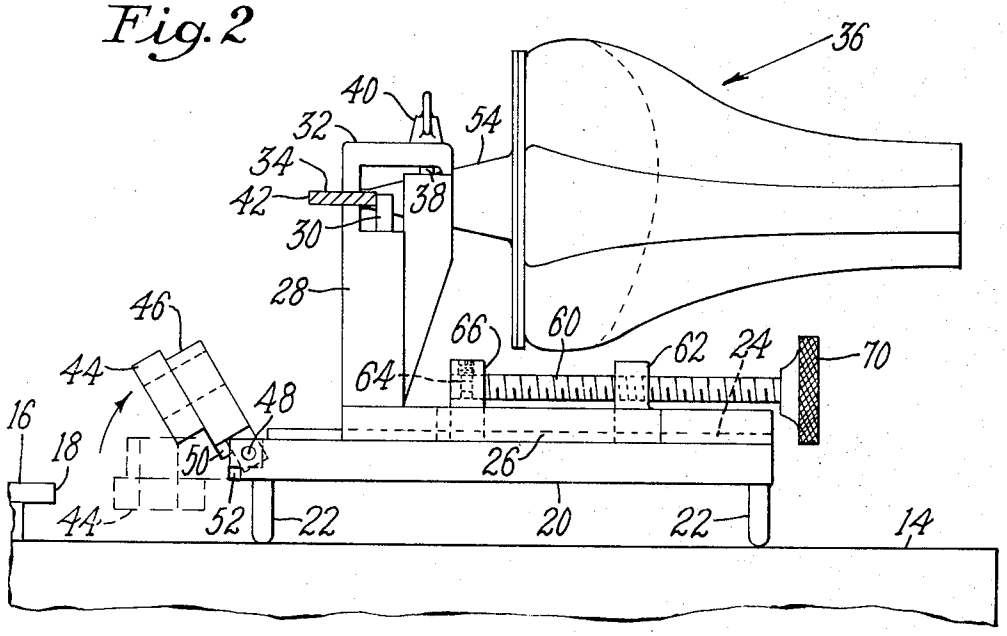
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Fig. 3

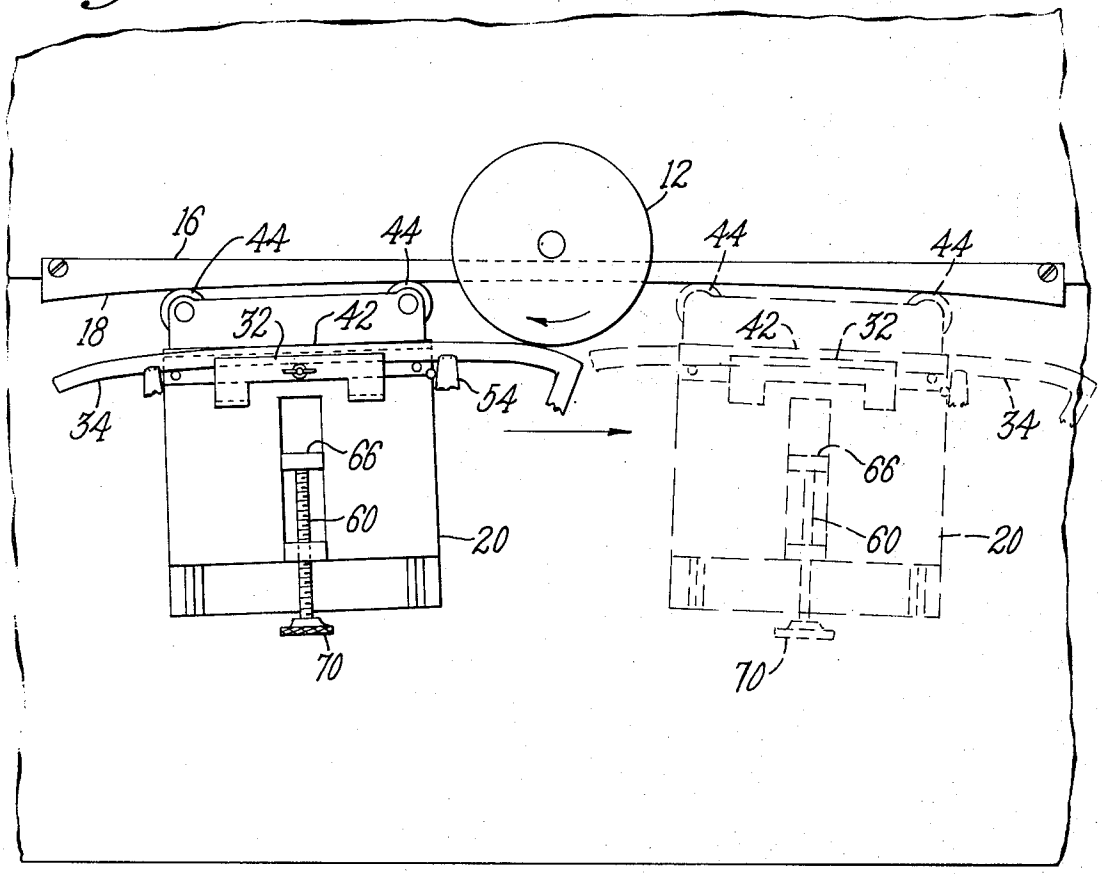


Fig. 4

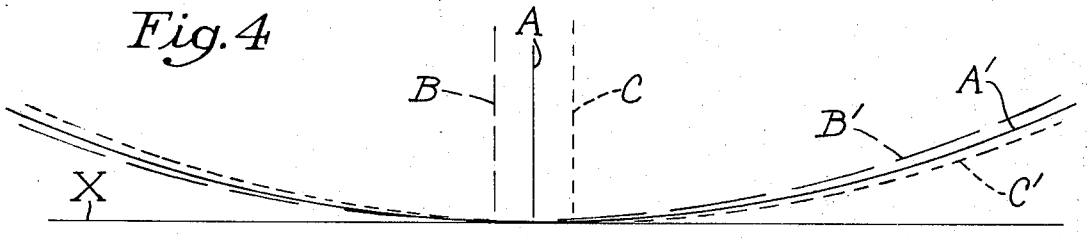


Fig. 5

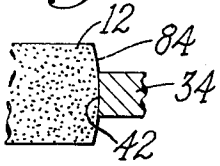


Fig. 6

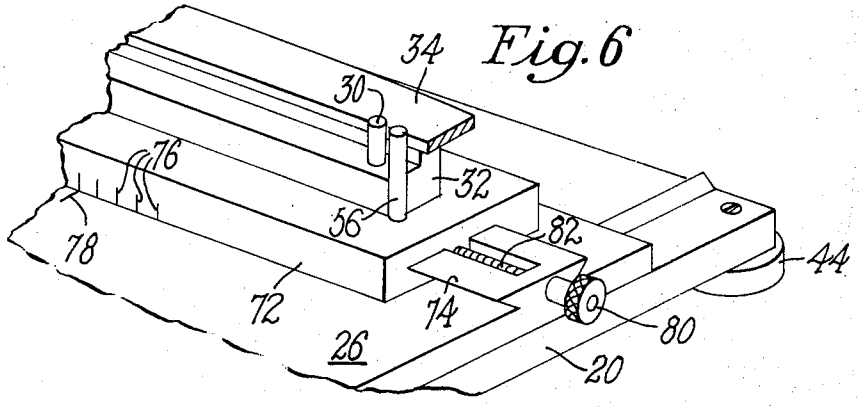


Fig. 7

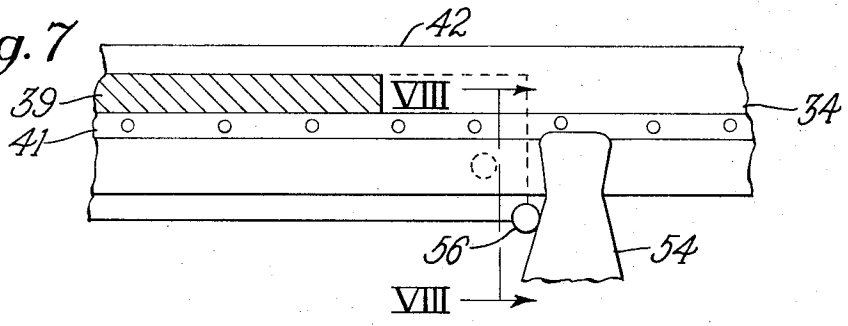
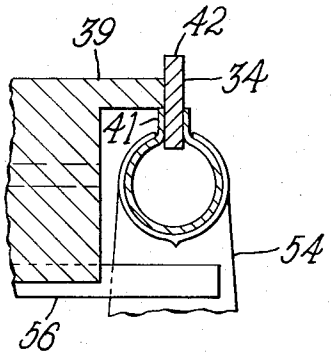


Fig. 8



SKATE SHARPENING DEVICES

BACKGROUND OF THE INVENTION

The common practice in sharpening ice skates is to provide a grinding wheel rotatable about an axis, usually a fixed vertical axis, and then manually support and move the skate relatively thereto in an effort to progressively present the blade lengthwise to the wheel while maintaining constant pressure between the wheel and the bottom of the blade.

This procedure does not assure satisfactory results. Moreover, when repeatedly practiced, as is customary, the resulting deviation from desired blade contour is likely to worsen. Each attempted sharpening by such hand-held approaches may remove excessive metal in one locality of the blade and not enough in another until ultimately the skater's balance and performance is adversely affected. With ice skating becoming a very popular sport around the calendar, there exists a great need for a blade sharpening mechanism by means of which predictable, high quality blade contouring can be conveniently provided.

SUMMARY OF THE INVENTION

In view of the foregoing it is a primary object of this invention to provide an ice skate blade sharpening mechanism of simple structure for generating a desired and predetermined curvature lengthwise in the ice-contacting surface of the blade.

More specifically it is an object of this invention to provide, for use with a grinder and a template mounted in fixed relation, an improved skate blade holding device whereby the ice tangency point of one blade contour of a skate will be established and made to correspond lengthwise with that of the other skate of a pair, and the contours, and their points of ice tangency may be uniformly reproduced at a later time or adjusted lengthwise as desired.

Another object of the invention is to provide ice skate sharpening equipment by means of which repeated sharpening of blades to maintain their predetermined longitudinal contour can be accomplished with minimal loss of blade stock.

In its method aspect the invention consists in a novel series of steps, conveniently practiced by usage of the illustrative embodiment herein disclosed, for intermediate shaping of a skate blade as well as the ultimate sharpening of its ice-contacting contour.

To these ends a feature of the invention resides in the combination, with a grinding tool operative in a fixed position, and means for supporting a contour cam or template with its longitudinal axis in predetermined relation to the tool, of an independently movable work holder, follower means adjustable on the holder and movable in progressive engagement with the cam, a skate blade clamp, mechanism for adjustably mounting the clamp on the follower means along an axis extending toward and away from the tool, and means for indexing a skate blade held on the clamp relative to the follower means to impose the shape of the template in a selected one of a plurality of different positions on the skate blade.

BRIEF DESCRIPTION OF DRAWINGS

The foregoing and other features of the invention will now be more particularly described in connection with an illustrative embodiment, and with reference to the accompanying drawings thereof, in which:

FIG. 1 is a plan view, with portions broken away, of an ice skate sharpening device, its follower means being indicated in three selected operating positions relative to a fixed contour cam;

FIG. 2 is a view in end elevation indicating a shoe skate blade in its initial loading or retracted clamping position in the device of FIG. 1;

FIG. 3 is a plan view corresponding to FIG. 1 but on a smaller scale and showing successive positions of the work holder and follower means as the blade is sharpened;

FIG. 4 is a schematic plan view, the curvature being exaggerated, and showing three different ice tangency points of a longitudinally radiused blade and corresponding to its initial longitudinal indexing;

FIG. 5 is a detail view in vertical section of a portion of a grinding wheel and indicating the transverse blade curvature imparted thereby;

FIG. 6 is a perspective view of an alternative work holder arrangement by means of which longitudinal indexing of a blade may be selected relative to the blade clamp template followers of a sharpening device;

FIG. 7 is a plan view, partly in section, of indexing means for a tubular blade; and

FIG. 8 is a section taken on the line VIII—VIII of FIG. 7.

DESCRIPTION OF PREFERRED EMBODIMENTS

Referring mainly to FIGS. 1 and 2, a skate blade sharpening device generally designated 10 comprises a grinding wheel 12 mounted for rotation about a fixed vertical axis, and a table 14 to which a selected contour cam 16 is secured and thereby supported in predetermined relation to the wheel 12. The cam has a vertical guide face 18 which may have any selected longitudinal curvature, but preferably will have a 9.0 foot radius to accord with a commonly accepted or standard specification employed by substantially all ice skate manufacturers.

Either in conjunction with an extension of the table 14 or independently thereof, a horizontal work support is provided on which a work holder comprising a carriage 20 is horizontally movable, for example on its legs 22 two of which are shown in FIG. 2. The carriage 20 is formed with opposed, parallel guide ways 24, 24 for receiving a slide 26 an upstanding portion 28 of which is fitted at its upper end with spaced blade positioning pins 30, 30 defining a line extending normal to the guide ways 24, 24. Hinged to the top of the portion 28 is a clamping plate 32 for securing a blade 34 of a skate generally designated 36 to be sharpened. A locking means shown in the form of a threaded stud 38 projecting from the portion 28 and through a bore in the plate 32 may receive a wing nut 40 to hold the blade in clamping relation with the slide 26.

When the work holder is to be used for sharpening tubular hockey skates as indicated in FIGS. 7 and 8, in lieu of using the pins 30, 30 for indexing along an axis parallel to the guide ways, the pins may be removed and an alternative clamping plate 39 mounted in the same manner as the plate 32 is engageable with a longi-

tudinal edge defined by the junction of a blade 34 and a flange 41 of its tube portion.

To enable the wheel 12 to impart the contour of the cam face 18 upon an ice contacting edge 42 of the blade 34 when adjustably positioned longitudinally with respect to the clamping plate 32 as will hereinafter be explained, the carriage 20 is provided with a pair of spaced elements such as follower rolls 44, 44 (FIGS. 1–3, inclusive). The rolls 44 are journalled in a holder 46 pivotally mounted on and slidable along a horizontal fulcrum pin 48 having end bearings in the carriage 20. An edge portion of the holder 46 is formed between the rolls 44 with at least one and preferably several teeth 50 which, when the rolls are lowered to horizontal operative dash line position shown in FIG. 2, mesh with correspondingly shaped indexing teeth 52 (FIG. 1) extending in greater number and formed on the slide 26. Accordingly, by lifting the roll holder 46 to its raised position (solid lines) shown in FIG. 2, the teeth 50, 52 are disengaged and the clamped skate blade 34 may in effect be adjusted longitudinally of the cam face 18 by axially moving the holder 46 on the pin 48 and normal to a median or reference nine foot radius A (FIG. 4) of that face to relatively adjusted positions on either side thereof designated B and C, for instance. In FIG. 1 the full line rolls 44 correspond to median position A; the teeth 50, 52 are then again enmeshed to lock the clamped blade in a selected longitudinal position A, B or C, for instance.

In order to establish a reference point for the longitudinal indexing of skate blade 34, it is an operational requirement that every skate 36 be clamped in the device with its toe end portion on the right, and with the front (i.e. toe-ward) strut 54 of the skate engaged on its inner side by a pin 56 projecting from the plates 32 or 39. When a skate is thus clamped with the pin 56 engaging the inside of its front strut 54, and the desired ice tangency point of a blade edge 42 is known to correspond with an end of the radius A, the teeth 50 are meshed with selected teeth 52 of the slide 26. To facilitate this longitudinal indexing a scale 58 (FIG. 1) on the slide will correspond to the ice blade tangency point for a radius A; if it is determined that it is desired to shift the ice tangency point longitudinally to correspond with the terminals of the radii B or C, for instance, it is a simple matter to disengage the teeth 50, 52, slide the clamped skate the desired number of tooth marks on the scale 58 either toewardly or heelwardly and reengage the teeth. The line X in FIG. 4 represents the ice surface tangent with the median A; a skater wanting a more toeward ice tangency rocking point would index in the direction of C. It is preferable that each skater by prick punch or other marking, permanent or temporary, on his blades 34 or skate register a point or identification of position that he desires his ice tangency to correspond with an index mark of the scale 58. In this way he can always sharpen his skates by duplicating the desired contour in the edge 42 and removing a minimum of blade stock. He can by resort to this same skate sharpening mechanism in any geographical area restore the desired blade contour and point of ice tangency or shift it in predictable manner.

For changing the effective distance between a clamped blade edge 42 and a grinding path determined by the wheels 44, and hence the maximum depth of cut in a single pass or series of passes with respect to the wheel 12, an adjusting screw 60 (FIGS. 1–3) threadedly extends through a bore of a lug 62 formed on the slide 26, and has an inner end secured against relative axial movement by a set screw 64 in a lug 66 on the carriage 20. The lug 66 slidably extends in a slot 68 parallel with the guide ways 24, 24. Accordingly, rotation of a knurled knob 70 affixed on the screw 60 shifts the slide 26 parallel to the guideways and the skate clamped on the slide is moved in a radial direction toward and from the grinding locality of the wheel 12.

The arrangement above described is predicated on direct manual adjustment of the clamped blade 34 and the slide 26 longitudinally to index them as desired relatively to the carriage 20 and the rolls 44. In FIG. 6 an alternate longitudinal indexing mechanism is shown wherein it is assumed the follower rolls 44 (one shown) have their axes fixed in the carriage 20. In the FIG. 6 construction corresponding parts are identified by the same reference characters heretofore employed. The blade clamp 32 is now provided with a mounting block 72 rabbetted to slide longitudinally of a skate blade on a mating tongue 74 formed on the slide 26. Registry as desired of a scale 76 on the block 70 with a reference mark 78 on the slide 26 is obtained by turning a knob 80 of an adjusting screw 82 extending through an end of the tongue 74 and threaded into the block 72.

Operation of the device and work holder to grind a skate blade 34 with selected ice contacting edge surface 42 will now be briefly reviewed. With the toe end extending to the right as indicated in FIGS. 1–3, the blade is clamped to the plate 32 or 39 with the pin 56 engaging the inner side of the front strut 54, and the pins 30 or flange 41 indexing the blade in a direction parallel to the guide ways 24 as above described. Next the clamped blade and the slide 26, by means of the teeth 50, 52 or of the knob 80, are selectively indexed longitudinally of the cam face 18. Now, assuming the knob 70 has been adjusted as appropriate to the depth of blade stock desired to be removed, the toe and heel portions of the skate are gripped and moved jointly with the carriage 20 to either side of the table 14 to cause the operating path of the wheel 12 to progress from the toe end to the heel end of the blade or the heel end to the toe end as indicated in FIG. 3.

If a particular periphery 84 of the wheel 12 is not of a transverse curvature desired in the blade, a suitable wheel 12 may be substituted.

The longitudinal blade curvature A', B' or C' (exaggerated in FIG. 4) will be imparted according to whether the point of ice tangency is to be at the end of the radius A, B or C, respectively. This in turn is based on the selected longitudinal indexing determined with reference to the scale 58 or 76.

We claim:

1. An ice skate sharpening device comprising a grinding tool operative in a fixed position, means for supporting a guide cam in predetermined relation to the tool, a carriage having follower means mounted for progressive engagement with the cam, a skate blade clamp adjustably mounted on the carriage for movement along an axis extending toward and away from an operating locality of the tool, and means for indexing relative to the follower means in a direction normal to said axis a skate blade fixedly held by the clamp.

2. A device as in claim 1 wherein the skate blade clamp is supported on a slide arranged in parallel guide ways in the carriage and extending substantially normal

to the longitudinal guide face of the cam, and the follower means is laterally shiftable with respect to the slide and provided with indexing means for selectively registering therewith in a direction normal to the guide ways.

3. A device as in claim **2** wherein the follower means is a pair of spaced rollers, and a holder therefor having at least one tooth meshable with teeth arranged on the slide.

4. The method of predeterminedly establishing an ice tangency point while shaping and/or sharpening a longitudinally radiused skating blade which consists in (1) providing an abrading means operative at a locality, (2) mounting a template having a longitudinally arcuate surface of fixed radius so that the surface symmetrically extends through said locality at a reference point, (3) clamping the blade on a carrying means to selectively position the blade relative to said reference point and transversely of said radius, and (4) relatively traversing the carrying means and said abrading means as determined by the template surface to shape and/or sharpen the blade and fix its ice tangency point.

5. A work holder for causing a grinding tool and an arcuate template mounted in fixed relationship to impose the shape of the template in a selected one of a plurality of different positions on the work, said work holder comprising an independently movable carriage formed with a guideway, follower means adjustably mounted on the carriage and arranged to progressively engage the arcuate surface of the template, a slide adjustably movable in the carriage guideway and provided with means for clamping the work, and mechanism for selectively indexing the work held by the clamping means relative to the follower means to predeterminedly establish the selected position of the template shape in the work.

6. A work holder as in claim **5** wherein said means for clamping the work is adapted to secure a blade of a skate to be sharpened and includes a stop for abutting a work strut supporting the blade, and said slide is adjustable in the carriage guideway in directions extending toward and from said arcuate surface.

7. A skate sharpening device for use with a grinding wheel having a fixed axis and an arcuate template mounted in predetermined relation thereto, said device comprising a carriage freely movable in a plane and having follower means progressively engageable with the template at spaced points, skate blade clamping means constrained for adjustable movement on the carriage in a direction extending toward and from the template, and means associated with the blade clamping means for registering a blade clamped thereon longitudinally thereof relative to said follower means whereby a predetermined curvature derived from the template may be ground on the blade in a selected longitudinal position.

8. For use with a grinding wheel rotatable about a fixed axis and a template formed with an arcuate guide surface and mounted in predetermined relation thereto, a skate blade holder comprising a carriage mounted for independent movement, a pair of spaced follower elements mounted on the carriage for progressive contact with the guide surface of said template during carriage movement, means for jointly adjusting the points of contact of the elements along said guide surface to shift the point of ice tangency of a skate blade secured to said holder and to be sharpened by said wheel, and blade clamping mechanism mounted on the carriage and movable thereon in a direction normal to a line tangent to the follower elements, said clamping mechanism including an abutment adapted to engage a strut of the skate blade to index the blade longitudinally relative to the follower elements.

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