United States Patent

Weisman

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[54] ICESKATE BLADE SHARPENING MACHINE AND METHOD OF USING SAID MACHINE FOR SHARPENING ICESKATE BLADES

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[52] **U.S. Cl.** **51/141**

[51] **Int. Cl.** **B24b 21/16**

[58] **Field of Search** ..... 51/135 R, 141

[56] **References Cited**

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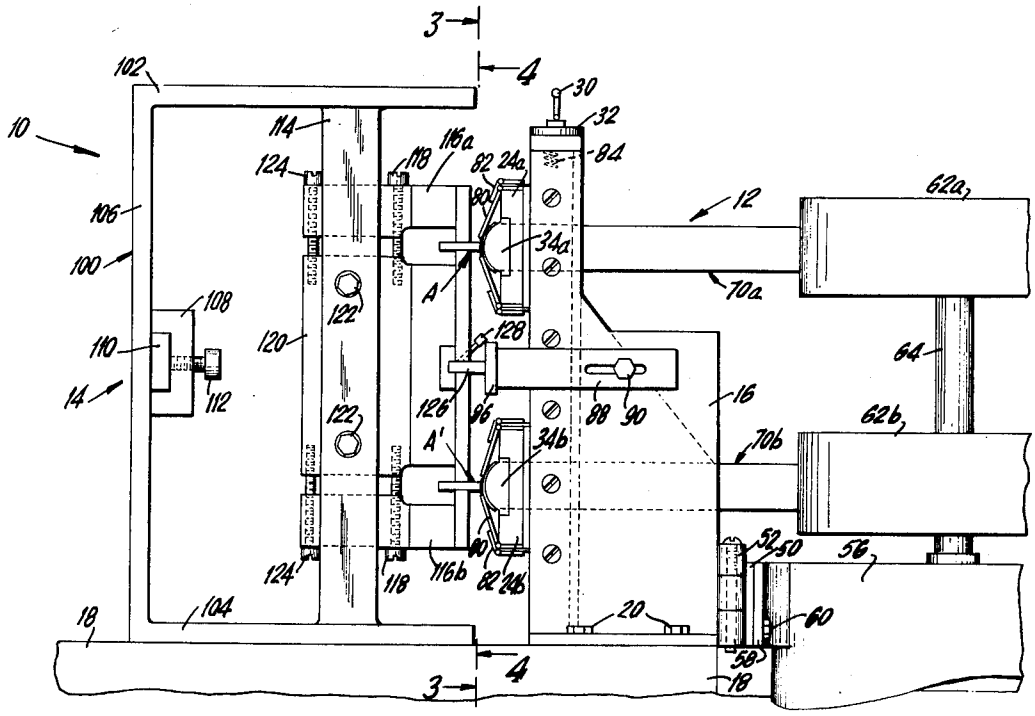
[57] **ABSTRACT**

A pair of iceskate blades are aligned with a templet in a jig. The templet is brought to bear against a rigid fence that is mounted on a structure that includes adjustably positioned endless abrasive belts that are arranged to contact and abrade the bottom surface of the iceskate blades.

30 Claims, 7 Drawing Figures



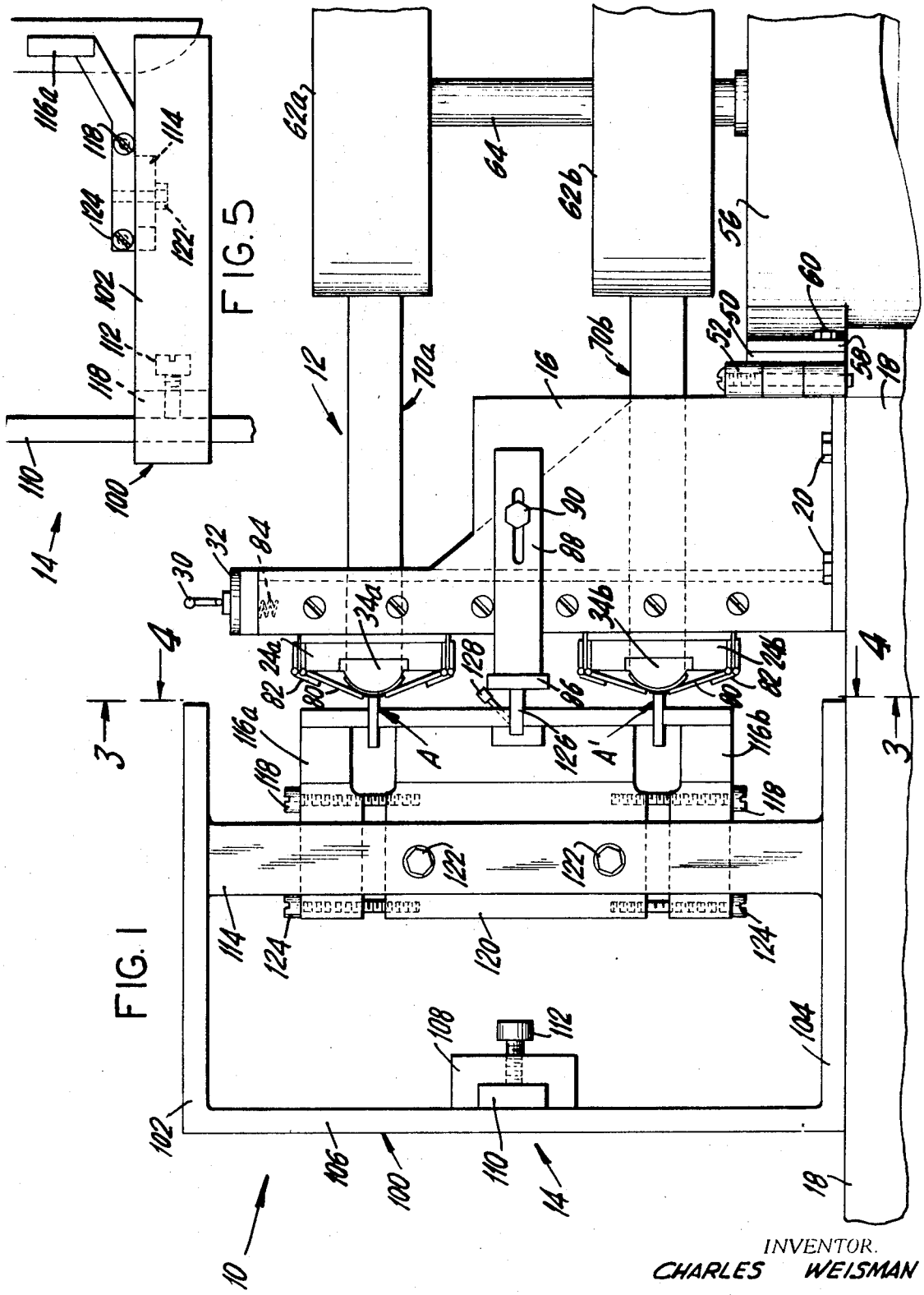


FIG. 1

FIG. 5

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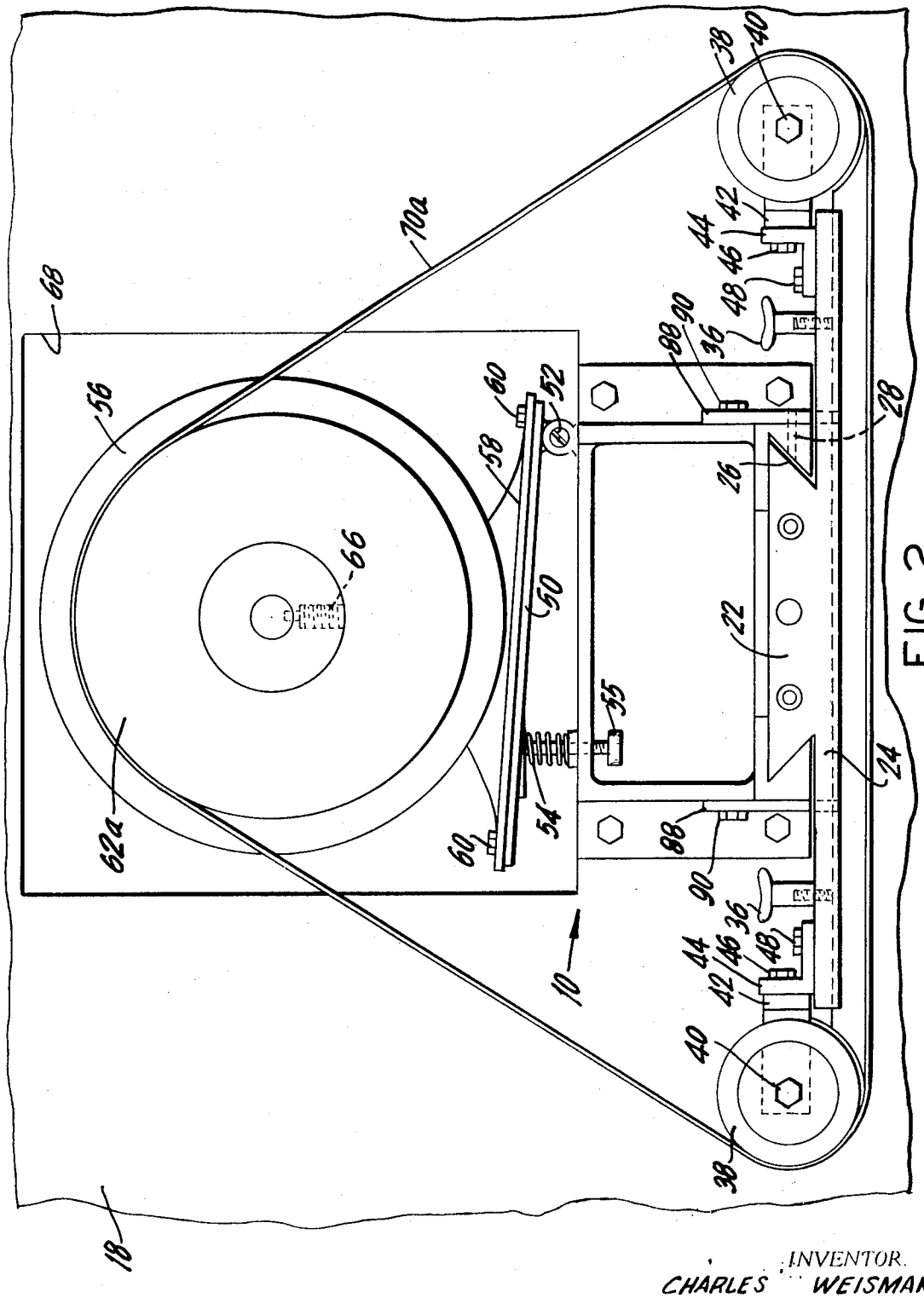

FIG. 2

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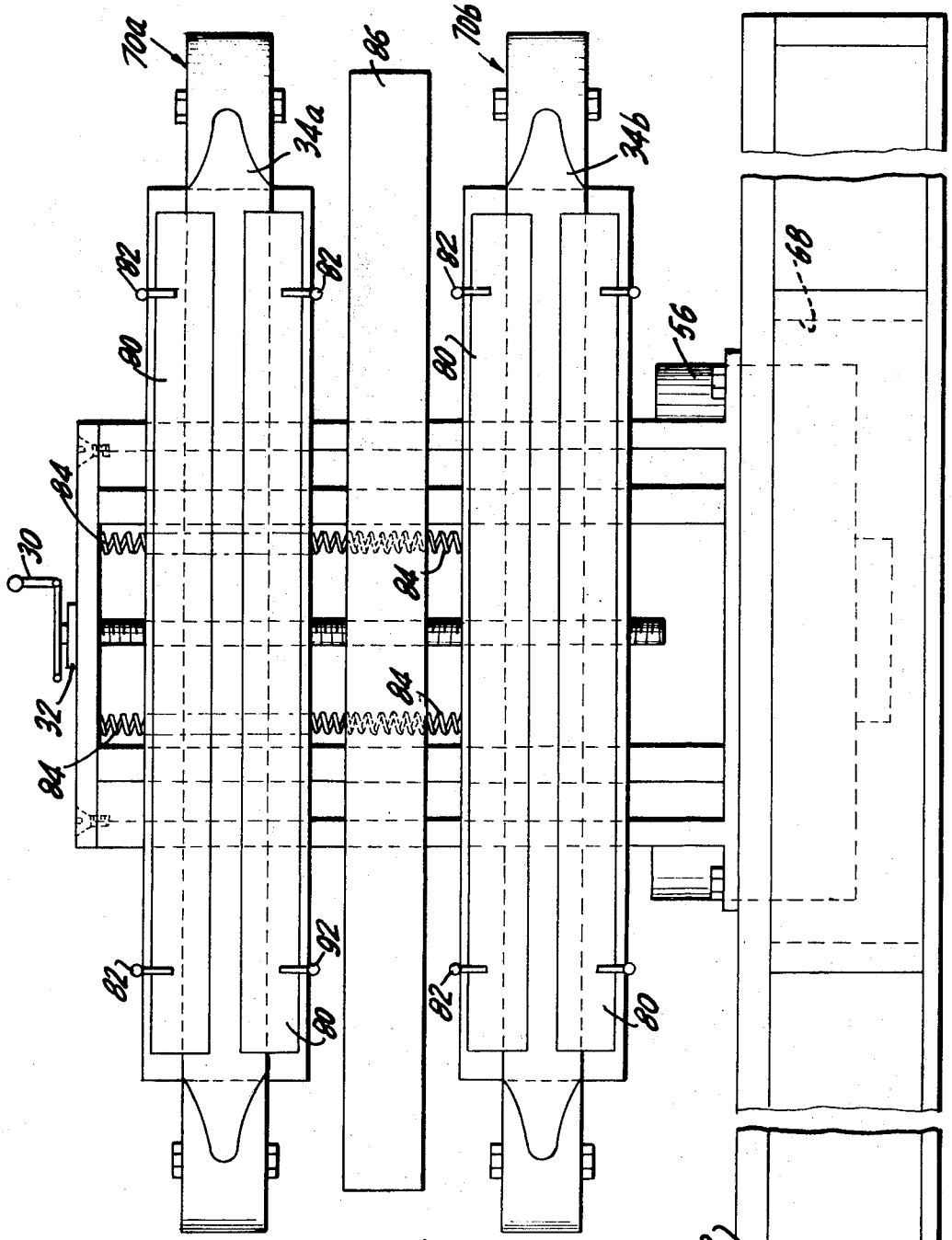

FIG. 3

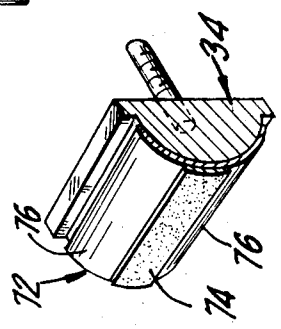

FIG. 3A

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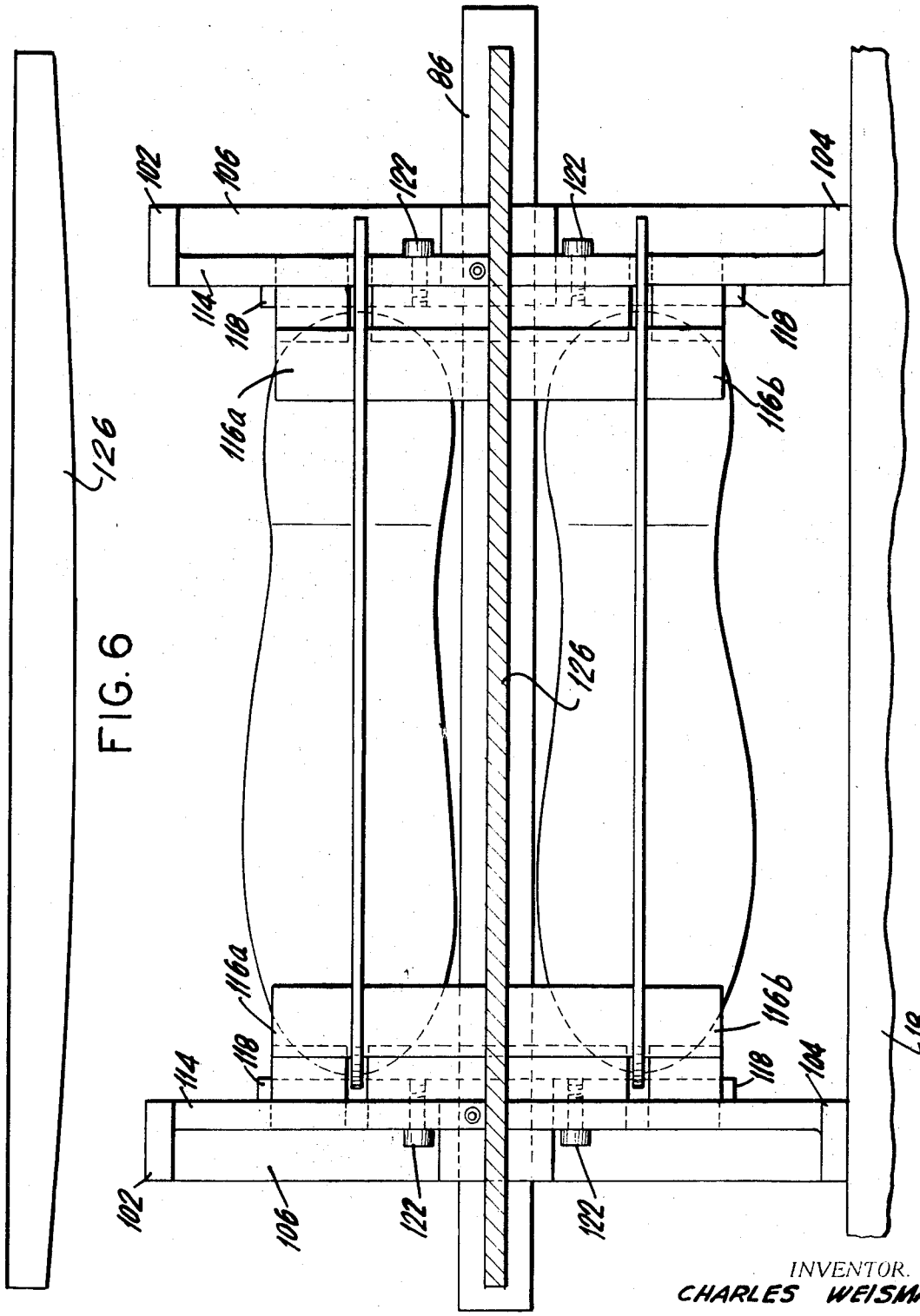

FIG. 6

FIG. 4

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ICESKATE BLADE SHARPENING MACHINE AND METHOD OF USING SAID MACHINE FOR SHARPENING ICESKATE BLADES

The aforementioned abstract is neither intended to define the invention of the application which, of course, is measured by the claims, nor is it intended to be limiting as to the scope of the invention in any way.

This invention relates generally to grinding machines and more particularly to a grinding machine for and a method of precisely sharpening the lower, running surface of a pair of iceskate blades.

BACKGROUND OF THE INVENTION

In order to achieve maximum efficiency in the use of iceskates, the blades must be accurately sharpened, so as to provide a concave surface on the bottom edge. The concave or hollow portion of the blade runs for the length of the blade and must be defined by sharp longitudinal edges that are in a common plane as near to perpendicular to the side edge of the blade as is possible. Furthermore, a generous radius is provided from the sole to the heel portions of the blade. A properly sharpened blade not only permits the skates to be used to maximum efficiency but it also makes skating easier thus adding to the enjoyment of skating for amateurs. Needless to say, professional skaters must maintain their blades at peak quality. However, in spite of the inherent hardness of the blade material they become dull with even limited use.

Iceskate blades can, of course, be honed by hand. However, it is virtually impossible to manually sharpen blades accurately regardless of the care that is exercised. For this reason, attempts have been made to develop machines that will perform the blade sharpening task automatically. Preferably, the machines should sharpen a pair of blades at the same time. While the prior art machines that are presently available represent a substantial improvement over hand operations, it has long been recognized that they leave much to be desired, as far as the accuracy of the sharpening and the convenience of the operation are concerned. Generally speaking the prior art machines use grinding stones that are susceptible to wear. Because of the expense of the stones they are frequently kept in service long after they have outlived their usefulness. While the stone can be dressed to restore it approximately to its original condition, this too, is a burdensome job that requires considerable skill in order to be done properly. The use of a high speed grinding stone requires considerable experience and even a skilled operator can improperly sharpen iceskate blades if he uses uneven pressure or if he does not manipulate the iceskate blades uniformly against the stone.

An example of the prior art, is disclosed in U.S. Pat. No. 1,487,142 issued on Mar. 18, 1924 to V.A. Boker. This patent teaches the use of a clamp for rigidly securing a pair of iceskate blades in parallel relationship to each other. The clamp is also provided with means for retaining a guide plate. The guide plate is positioned against an arcuate guide that is located between a pair of rotatable grinding stones. When the stones are driven by a motor, the operator rocks the guide plate against the guide so that the iceskate blades are abraded by the stones. It is apparent that the success of the sharpening operation depends upon the skill and manual dexterity of the operator. Moreover, the stones must be frequently dressed to maintain them in their best condition.

SUMMARY

The present invention by way of contrast, provides means for accurately sharpening a pair of iceskate blades whereby the need for an operator's skill and manual dexterity is minimized. Further, the present invention provides means for automatically grinding a transversely concave surface on the running edge of the blade in addition to the longitudinal radius. In accordance with this invention, the iceskate blades are held in a fixture in spaced parallel relationship to each other and to an accurately formed templet that is positioned intermediate to the two blades. The fixture is then brought adjacent to a grinding machine that includes two spaced endless abrasive belts that are in opposition to the blades. The belts are easily adjustable and easily replaced when worn. A rigid fence is positioned opposite the templet. The belts, in the vicinity of the blades traverse a substantially linear path as opposed to the periphery of the circular grinding stones used in the prior art. With the templet abutting the fence, all that is necessary for the operator to do is gently rock the templet back and forth against the fence so that the blades are ground in accordance with the shape of the templet. Means are provided for vertically adjusting the belts relative to each other, the belts being of a new type having an abrasive central section formed on a flexible material. The outboard lengths of the belts are free of abrasive material.

Accordingly, the primary object of the present invention is to provide an improved iceskate blade sharpening machine.

It is another object of the present invention to provide an iceskate blade sharpening machine utilizing endless abrasive belts.

It is a further object of the present invention to provide means for clamping a pair of iceskate blades on a jig in spaced parallel relationship to a templet, the blades and the templet being in opposition to endless abrasive belts and a rigid fence, respectively.

It is an additional object of this invention to provide an improved iceskate blade sharpening machine, as described above, further including means for accurately adjusting the position of the abrasive belts.

Still another object of this invention is to provide an improved method for sharpening iceskate blades.

These and other objects, features and advantages of the invention will, in part, be pointed out which particularity and will, in part, become obvious from the following more detailed description of the invention, taken in conjunction with the accompanying drawing which forms an integral part thereof.

In the various figures of the drawing like reference characters designate like parts.

BRIEF DESCRIPTION OF THE DRAWING

In the drawing:

FIG. 1 is a side elevational view, partly in section, illustrating the improved iceskate blade sharpening machine comprising the present invention;

FIG. 2 is a plan view of the belts and drive means therefor that are used with the present invention;

FIG. 3 is an elevational view of the belts and support means therefor taken along line 3—3 of FIG. 1;

FIG. 3A is a fragmentary, perspective view illustrating a portion of an endless abrasive belt and the support means therefor;

FIG. 4 is an elevational view of the iceskate blade holding jig taken along line 4—4 of FIG. 1;

FIG. 5 is a fragmentary plan view of the iceskate blade holding jig; and

FIG. 6 is a plan view of a typical templet used with the present invention.

Referring now to the drawing and particularly to FIGS. 1, 2, 3 and 3A, there is shown an iceskate blade sharpening machine **10** comprised of a grinding section **12** and a jig or support section **14**. The grinding section **12** is comprised of a support casting **16** adapted to be secured to a table **18** by means of bolts **20**. The upper portion of the casting **16** includes, as shown in FIG. 2, a dovetail slide **22** which is engaged by a platen mount **24** that includes a gib **26**. Screws **28** provide means for properly aligning the gib **26** with respect to the casting **16**. At the top of the casting there is provided a micrometer screw **30** (FIG. 1 and FIG. 3) with a 1/1000-inch indicator dial **32**.

Upper and lower platens **34***a* and **34***b*, respectively, are secured to the upper and lower platen mounts **24***a* and **24***b* by means of screws **36**. The platens **34***a* and **34***b* may have a

radius of one-half inch to 2 inches. At each end of each of the platen mounts **24***a* and **24***b* there are provided upper and lower idler pulleys **38** that turn on axles **40**. Each of the idler pulleys are mounted on an arm **42** that is secured to an angle bracket **44** by means of bolts **46**. The holes in the angle bracket **44** through which the bolts **46** pass are slotted in the vertical direction to permit vertical adjustment of the pulleys **38**. The angle brackets **44** are secured to the platen mount **24** by means of bolts **48** which pass through horizontally slotted holes in the angle brackets **46** so as to permit horizontal adjustment of the idler pulleys **38**.

Behind the vertical casting **16** there is provided a vertical plate **50** which is hingedly mounted thereon by means of a pin **52**. A compression spring **54** acts between the plate **50** and the casting **10** so as to normally urge the plate **50** in a direction away from the casting **10**. A screw **54** provides means for adjusting the biasing effect of the spring **52**. An electric motor **56** is secured to the plate **50** by means of a motor mount **58** and screws **60**. Upper and lower drive pulleys **62***a* and **62***b* are secured to the drive shaft **64** of the motor **56** by means of set screws **66**, one of which is shown typically in FIG. **2**. The motor mount **58** has slotted screw holes so that the motor **56** and the drive pulleys **62***a* and **62***b* can be vertically adjusted. A motor well **68** is provided in the table **18** to allow space for the motor **56**.

A pair of endless abrasive belts **70***a* and **70***b* are trained about the upper and lower drive pulleys **62***a* and **62***b* and the idler pulleys **38**. As shown best in FIG. **3**A, the abrasive belts **72** are coated only in the center portion **74** with the longitudinal edge portions **76** being free of any abrasive material. The abrasive belts **72** are made of a very flexible cloth so that they may very readily assume the radius of the platens **34***a* and **34***b*. Along the top and bottom edges of the upper and lower platen mounts **24***a* and **24***b* there are provided hinges **80** that are lightly pressured by springs **82** so that the hinges **80** press against the moving belts **72** and thereby keep them formed to the shape of the platens **34***a* and **34***b*.

As shown best in FIG. **3**, the micrometer screw is threaded into the upper and lower platen mounts **24***a* and **24***b* with oppositely directed threads in each of the platen mounts **24***a* and **24***b*. That is, the upper portion of the micrometer screw **30** that is threaded in the upper platen **24***a* will be provided with right hand threads, for example, while the lower end of the micrometer screw **30** is threaded into the lower platen mount **24***b* where it will be provided with a left hand screw. Thus, when micrometer screw **30** is rotated the platen mounts **24***a* and **24***b* will move towards and away from each other in unison. In order to take up any axial play, that may be inherent in the mating screw threads, compression spring means **84** are positioned between the casting **16** and the upper platen mount **24***a* and also between the upper and lower platen mounts **24***a* and **24***b*.

The grinding section **12** of the device is completed by means of a fence **86** which is integral with laterally spaced arms **88** that are secured to the casting **16** by means of screws **90**. Horizontally slotted holes in the arms **88** permit adjustment of the fence towards and away from the casting **16** in a horizontal plane.

Reference is now made to FIGS. **1**, **4** and **5** for a description of the jig or iceskate blade support section **14** of the machine **10**. The jig **14** is comprised of two members **100** consisting of upper and lower plates **102** and **104** respectively, and a connecting plate **106**. A U-shaped bracket **108** is formed integrally with the connecting member **106** in order to receive a transverse alignment bar **110**. Screws **112** rigidly clamp the members **100** to the alignment bar **110** when the members **100** are in their proper position. A cross piece **114** extends between each of the upper and lower plates **102** and **104** and includes upper and lower blade clamps **116***a* and **116***b* secured thereto by means of screws **118**. The blade clamps **116***a* and **116***b* further comprise a central portion **120** that is secured to the cross pieces **114** by means of screws **122**. Screws **124** extending between the blade clamp members **116***a* and **120** as well as **116***b* and **120** are used to adjust for various thicknesses of blades. A templet **126** which will be described in greater detail hereinafter is secured to the right hand edge (FIG. **1**) of the central blade clamp portion **120** by means of a set screw **128**.

FIG. **6** is a plan view of a typical templet **126**. The templets are approximately 16 inches long and 0.156 inch thick. They may be shaped to radii of 6 feet to 30 feet. The choice of the radius is made by the skater in accordance with the type of skating he wishes to do. A typical skate blade has a 7 foot radius rock and a concave running surface with a radius of five-eighths of an inch. The radius rock is the curvature of the bottom of the blade along its length. The concave hollor is the round depth of the bottom of the blade. The edges of the blade are defined as the inner and outer lower edges formed by the sides and bottom of the blade. It is essential that a line drawn transversely of the edges of the blades be perfectly square with the sides of the blades.

In order to sharpen a pair of blades, the thickness of the blade is measured with a micrometer. The standard thickness of a blade is usually 0.156 inch. The micrometer adjusting screw **30** is turned to indicate 0.156. It should be noted at this time that the center of the platens **34***a* and **34***b* are at the same height above the table **18** as the points A and A^1 in FIG. **1**. When this is so, the indicator dial **32** reads 0.000. The screw of the micrometer **30** is provided with **20** threads per inch in order to impart a half-thousandths vertical movement of the platen mounts **34***a* and **34***b* while indicating one-thousandths on the indicator **32**. Since the micrometer screw has 20 threads per inch, it will move the platens **34***a* and **34***b* up and down (depending upon the direction of rotation thereof) half of a thousand, while the indicator dial shows 1,000. Thus, the center of the blade is aligned vertically with the center of the platens **34***a* and **34***b*. With the templet **126** positioned against the fence **86**, the templet **126** is aligned with the blades at the front and back of the blades. The templet **126** and the fence **86** are vertically aligned by means of a machinist's square so that they are in the same plane.

The motor **56** is turned "ON" and the skate blade is rocked against the moving abrasive belts **72***a* and **72***b* which are backed up by the platens **34***a* and **34***b* respectively. It is not necessary to sweep the jig across the belts **72** because of the linear extent of the belts between the pulleys. After several passes against the belt **72**, the blades will acquire the shape of the templet **126** and will also acquire a hollow that conforms to the radius of the platens **34***a* and **34***b*. After the skates are removed from the jig **14**, any slight burs on the side of the blade may be removed with a small, fine grained stone.

As hereinbefore described a method for sharpening a pair of iceskate blades comprises the steps of aligning the blades with a reference template in a jig, placing the template against a flat, elongated fence and then rocking the blades on the fence so that the blades are abraded by endless, abrasive belts moving along a substantially linear path in the vicinity of the blades. The step of aligning the blades may include the step of aligning both the upper and lower edges of each blade with respective edges of the template. An additional step in the sharpening method may be the final removal of small burs using fine polishing means.

While the foregoing method contemplates sharpening two blades at one time, the structure of this invention lends itself to an iceskate blade sharpening method wherein one blade is sharpened at a time and then the sharpened blade is used as a template for sharpening the other blade of a pair. For example, only a single abrasive belt is used. A single blade is aligned in the jig with a template and is sharpened as described above. Then the jig is inverted and the template is replaced by the previously sharpened blade. Another blade is placed in the jig and is sharpened using the previously sharpened blade as the template. In this manner, the second blade is shaped exactly as the first.

It will be appreciated from the foregoing, that since the abrasive belts move along the length of the blades during shar-

pening, a very smooth skating surface is produced and the edges are very sharp and uniform. The radius rock of blades that have been improperly sharpened, or which have been worn from excessive use, may very easily be restored by means of standard templets. Because of the design of the apparatus, it is virtually impossible to accidentally dig into the blade while it is being sharpened. It is a very simple matter to remove a blemish anywhere on the blade by sharpening only that part. The apparatus is very simple to use and obviates the need for any skill or manual dexterity on the part of the operator.

It has been disclosed heretofore the best embodiment of the invention presently contemplated. However, it is to be understood that various changes and modifications may be made by those skilled in the art without departing from the spirit of the invention.

What I claim as new and desire to secure by Letters Patent is:

1. An apparatus for sharpening an iceskate blade, said apparatus comprising the combination of:
   a. first frame means;
   b. a motor mounted on said first frame means, said motor having rotatable output means;
   c. at least one endless, abrasive belt driven by said motor output means;
   d. means on said first frame means for supporting said belt whereby at least a portion thereof traverses a substantially linear path;
   e. second frame means for removably supporting at least one iceskate blade in opposition to said belt; and
   f. template means and template follower means, one of said last two mentioned means being secured to said first frame means, the other of said last two mentioned means being secured to said second frame means, said template follower means being in opposition to said template means and arranged to be contacted by the surface thereof whereby the iceskate blade is placed in contact with and is abraded by said belt in accordance with the contour of said template means.

2. The apparatus in accordance with claim 1 wherein said belt supporting means comprises elongated platen means having a convex transverse cross section, said belt being flexible and adapted to conform to the shape of said platen means.

3. The apparatus in accordance with claim 2 further includes means for adjusting the position of said platen means relative to said blade supporting means.

4. The apparatus in accordance with claim 3 wherein said means for adjusting the position of said platen means comprises a screw journaled in said first frame means and threaded through said platen means whereby rotation of said screw moves said platen means relative to the blade and in a direction perpendicular to the longitudinal plane of the blade.

5. The apparatus in accordance with claim 3 wherein said means for adjusting the position of said platen means comprises a tongue and groove arrangement for coupling said platen means and said first frame whereby said platen means is moveable in a direction perpendicular to the longitudinal plane of the blade and means for retaining said platen means in its adjusted position.

6. The apparatus in accordance with claim 3 wherein said means for adjusting the position of said platen means comprises means for moving said platen means in a plane parallel to the longitudinal plane of the blade, said movement of said platen means being relative to said first frame means, and means for retaining said platen means in its adjusted position.

7. The apparatus in accordance with claim 1 wherein said belt has an abrasive surface only in the central portion thereof, the longitudinal edges of said belt being free of said abrasive.

8. The apparatus in accordance with claim 7 further including means for retaining the longitudinal edges of said belt on said belt supporting means.

9. The apparatus in accordance with claim 1 further including a pair of spaced apart idler pulleys positioned at the ends of said belt support means, said pulleys together with said motor output means providing means for guiding said belt along a substantially triangular path.

10. The apparatus in accordance with claim 1 further including means for releasably clamping the blade on said second frame means.

11. The apparatus in accordance with claim 1 wherein said template means has an arcuate surface conforming to the desired blade rock.

12. The apparatus in accordance with claim 11 further including means for releasably clamping said template means in said second frame means.

13. The apparatus in accordance with claim 1 wherein said template follower means has a substantially flat surface adapted to abut said template means.

14. The apparatus in accordance with claim 13 further including means for releasably clamping said template follower means in said first frame means.

15. The apparatus in accordance with claim 1 wherein said second frame means comprises first and second support members and means for adjusting the lateral spacing there between.

16. An apparatus for simultaneously sharpening a pair of iceskate blades, said apparatus comprising the combination of:
   a. first frame means;
   b. a motor mounted on said first frame means, said motor having rotatable output means;
   c. a pair of endless abrasive belts driven by said motor output means, said belts being spaced apart in a direction parallel to the rotational axis of said motor output means;
   d. means on said first frame means for supporting said pair of belts whereby at least a portion of each of said belts traverses a substantially linear path;
   e. second frame means for removably supporting the pair of iceskate blades in substantially the same spaced apart relation and in opposition to said pair of belts; and
   f. template means and template follower means, one of said last two mentioned means being secured to said first frame means, the other of said last two mentioned means being secured to said second frame means, said template follower means being in opposition to said template means and arranged to be contacted by the surface thereof whereby the iceskate blades are placed in contact with and are abraded by said belt in accordance with the contour of said template means.

17. The apparatus in accordance with claim 16 wherein said belt supporting means comprises a pair of spaced elongated platen means each having a convex transverse cross section, said belts being flexible and adapted to conform to the shape of said platen means.

18. The apparatus in accordance with claim 17 further includes means for adjusting the position of each said platen means relative to said blade supporting means.

19. The apparatus in accordance with claim 18 wherein said means for adjusting the position of said platen means comprises a screw journaled in said first frame means and threaded through said platen means whereby rotation of said screw moves said platen means relative to the blades and in a direction perpendicular to the longitudinal plane of the blades.

20. The apparatus in accordance with claim 18 wherein said means for adjusting the position of said platen means comprises a tongue and groove arrangement for coupling said platen means and said first frame whereby said platen means is moveable in a direction perpendicular to the longitudinal plane of the blade and means for retaining said platen means in their adjusted position.

21. The apparatus in accordance with claim 18 wherein said means for adjusting the position of said platen means comprises means for moving said platen means in planes parallel to the longitudinal plane of the blades said movement of said platen means being relative to said first frame means, and means for retaining said platen means in its adjusted position.

22. The apparatus in accordance with claim 16 wherein said belts have an abrasive surface only in the central portion thereof, the longitudinal edges of each said belt being free of said abrasive.

23. The apparatus in accordance with claim 22 further including means for retaining the longitudinal edges of said belts on said belt supporting means.

24. The apparatus in accordance with claim 16 further including a pair of spaced apart idler pulleys positioned at the ends of said belt support means, said pulleys together with said motor output means providing means for guiding said belts along a substantially triangular path.

25. The apparatus in accordance with claim 16 further including means for releasably clamping the blade on said second frame means.

26. The apparatus in accordance with claim 16 wherein said template means has an arcuate surface conforming to the desired blade rock of each of the blades.

27. The apparatus in accordance with claim 26 further including means for releasably clamping said template means in said second frame means.

28. The apparatus in accordance with claim 16 wherein said template follower means has a substantially flat surface adapted to abut said template means.

29. The apparatus in accordance with claim 28 further including means for releasably clamping said template follower means in said first frame means.

30. The apparatus in accordance with claim 16 wherein said second frame means comprises first and second support members and means for adjusting the lateral spacing there between.

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