

Oct. 18, 1938.

A. LOOMIS

2,133,625

WOOD-WIND INSTRUMENT

Original Filed Dec. 21, 1936

3 Sheets-Sheet 1

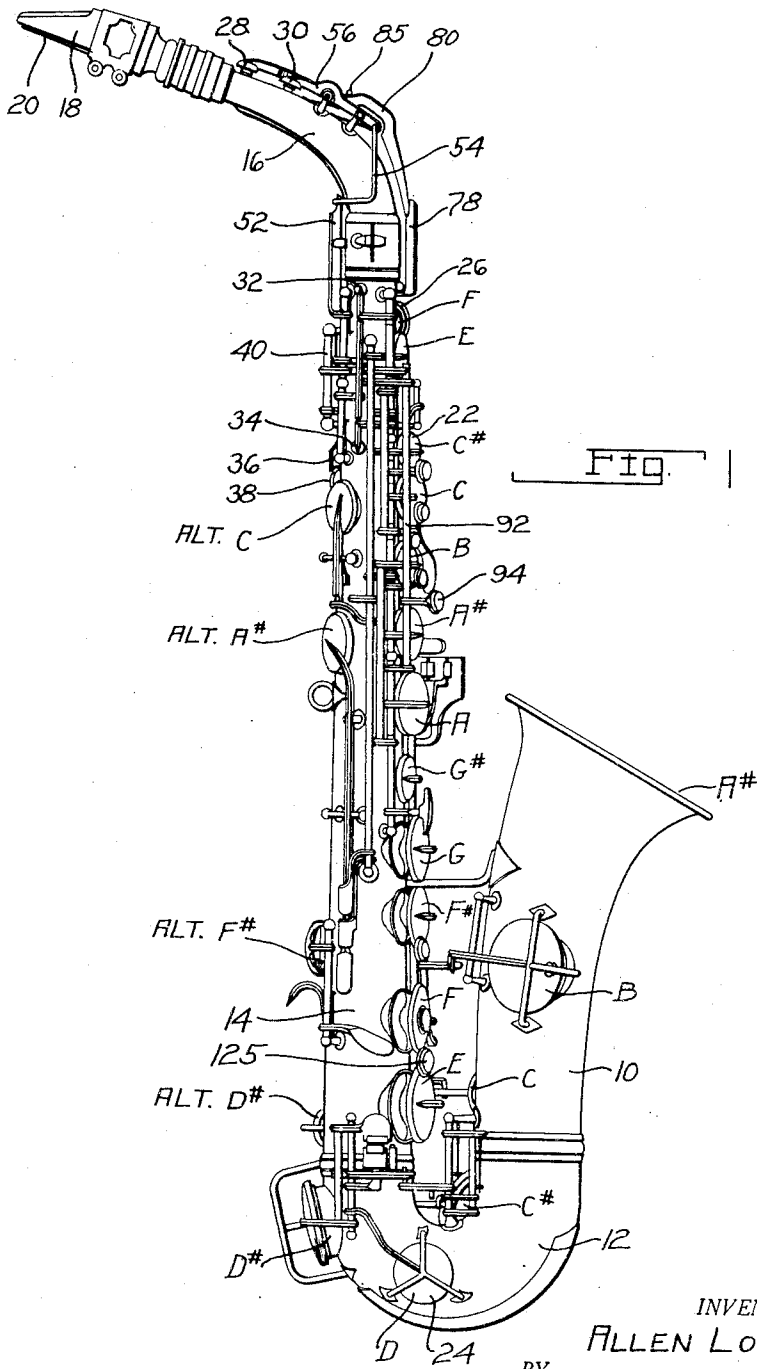


Fig. 1

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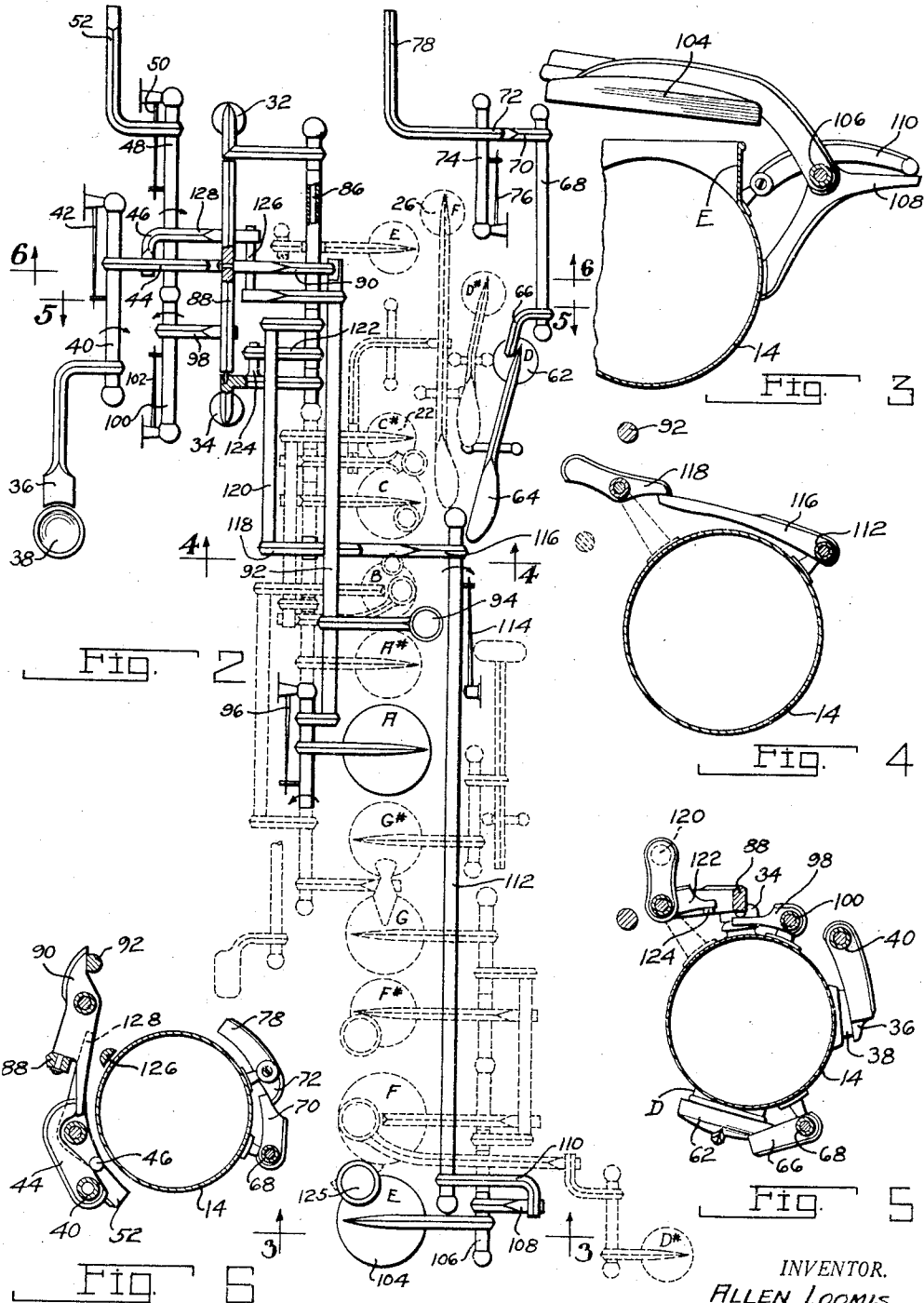
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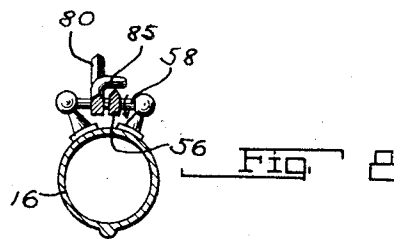
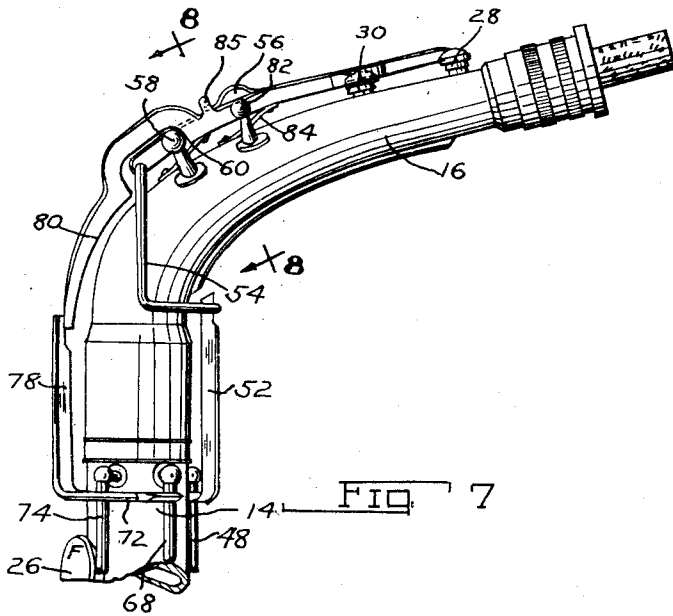
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WOOD-WIND INSTRUMENT

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,133,625

WOOD-WIND INSTRUMENT

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Original application December 21, 1936, Serial No. 116,948. Divided and this application September 17, 1937, Serial No. 164,341

7 Claims. (Cl. 84—385)

This invention relates to woodwind instruments and more particularly to automatic operating means for a series of octave holes on a woodwind instrument.

In woodwind instruments it is necessary that a small hole known as an octave hole be provided approximately midway of the vibrating column of air for proper playing in the upper register. For theoretically perfect operation it would be necessary to provide a separate octave hole for each note in the upper register but this would unduly complicate the instrument from both the playing and manufacturing standpoints. Manufacturers have, therefore, compromised for many years by providing only two octave holes. With this arrangement it was difficult to sound all of the notes in the upper register and tone clarity in all of these notes was practically impossible to attain.

It is accordingly one of the objects of the invention to provide a woodwind instrument having a plurality of octave holes so arranged as to produce true tones throughout the upper register.

Another object of the invention is to provide a woodwind instrument having a plurality of octave holes which are controlled automatically by normal playing of the instrument.

In one very desirable arrangement I provide, in addition to the pair of spaced octave holes usually provided in a woodwind instrument, an added pair of octave holes, the four holes being selectively automatically opened when particular notes or groups of notes are played, thus improving the ease of sounding the notes in the upper register and the tone of the instrument without complicating the playing of the instrument. It is very important that the three holes not in use should automatically be closed, and an important feature of my invention relates to the provision of means for insuring this.

I prefer to accomplish the above objects by providing four octave holes, normally closed by pads; and by providing a single octave key adjacent the left hand thumb rest which, whenever it is depressed, results in opening one or the other of these octave holes and closing the others and by providing means interconnecting the various octave hole pads and the keys of the instrument whereby with the octave key depressed the appropriate octave hole is opened by the operation of the keys required to play a particular note.

Other objects, advantages and desirable constructions according to the invention will be apparent from the following description of the

embodiment shown on the accompanying drawings, in which:

Figure 1 is an elevational view of the right side of an alto saxophone employing an octave mechanism having four octave holes;

Figure 2 is a developed view of the key mechanism on the branch or body of the instrument of Figure 1, the parts relating to the invention being shown in full lines and the remaining associated parts in dotted lines;

Figures 3, 4, 5, and 6 are transverse sections on an enlarged scale through the branch of the instrument of Figure 1 taken respectively on the lines 3—3, 4—4, 5—5, and 6—6 of Figure 2, the lines of the sections being shown on Figure 2 to facilitate correlating the views;

Figure 7 is an elevation on an enlarged scale of the mouthpiece of the instrument of Figure 1; and

Figure 8 is a section on the line 8—8 of Figure 7.

The drawings illustrate the invention embodied in a saxophone but it is to be understood that this is for purposes of illustration only and that the invention is applicable to woodwind instruments of any type, whether made of wood or metal, such as clarinets, oboes, bassoons and the like.

Referring to the drawings, all of the instruments shown are of the type known as alto saxophones comprising a bell 10, a U-shaped tubular member 12 known as the bow, and a tapered tube or main body 14 called the branch, together with a curved mouthpiece 16 detachably connected to the branch and detachably carrying a mouthpiece 18 provided with a reed 20; all of these members being connected in the order named to form the body of the instrument.

Tone holes are provided at spaced intervals along the body of the instrument, each having the usual key-operated pad whereby it may be closed or opened at the will of the player. Each of the tone holes is designated by a note of the musical scale which is the note sounded by the instrument when that hole is open and the holes above it (i. e. toward the mouthpiece) are closed. The arrangement of the tone holes illustrated is identical with standard instruments, as are also the mechanisms for opening and closing the holes, and therefore, will not be set forth in detail as they are well known to those skilled in the art.

The range of the instrument is from A# on the second line below the staff (B flat in the second space) to F' in the fourth space above the staff and comprises 32 notes in all or approxi-

mately three octaves. As every note except A, G#, G and F# occurs three times, they will be designated lower, middle, or upper according to their positions in the scale of the instrument.

5 The first sixteen notes from lower A# to middle C#, generally called the lower register, are played in ascending scale by first closing all the tone holes to sound lower A# and then successively opening the tone holes, beginning at the bell, 10 until that numbered 22 is opened (disregarding those marked "Alt.", to indicate alternates), and in playing all of these notes the air column in the body of the instrument vibrates in its fundamental frequency.

15 The remaining 16 notes, generally called the upper register, beginning at middle D, are played by closing all the tone holes down to 24 and successively opening the tone holes until that designated by the numeral 26 is opened, at the same 20 time increasing the blowing pressure to cause the air column to vibrate in its first harmonic.

In order to produce these first harmonic tones easily and to prevent them from being toneless and unstable, it is necessary to create a leak 25 somewhere near the center of the vibrating column of air. This is done by providing small holes called octave holes which are opened when these notes are played. At present, standard instruments are provided with two octave holes, one 30 of which is opened while approximately half of the upper register notes are being played and the other of which is open while the remaining upper register notes are played.

In the illustrated instrument four octave holes 35 28, 30, 32 and 34 are provided. The holes 28 and 30 are in the mouthpipe 16, one being open when the group of notes comprising upper F, E, D# and D is played, and the other being open when the group comprising upper C#, C, B, A# 40 and A is played and being closed at all other times. Holes 32 and 34 are in the branch 14 and are respectively open when the group of notes middle G#, G, F#, F and E and the group 45 D# and D, are played and closed at all other times. All four of the octave holes are brought into play by depressing the usual octave key or spatula 36 located adjacent the left hand thumb rest 38 and employing the usual fingering required to play the respective notes.

50 An important minor feature of the invention relates to an additional fingering permitted by the location of the octave hole 34 whereby middle C# may be played in the same manner as lower C# but with the spatula 36 depressed.

55 The spatula 36 is mounted on a hinge 40 urged by a spring 42 in the direction of the arrow. An arm 44 on the hinge 40 engages a wiper 46 on a hinge 48 urged in the direction of the arrow by a spring 50, weaker than spring 42. 60 A crank arm 52, mounted on the hinge 48 engages a ring 54 surrounding the mouthpipe 16 and secured to a lever 56 hinged at 58. The lever 56 carries the pad for octave hole 30 and is urged by a leaf spring 60 in the direction to 65 close the octave hole. Spring 60 is weaker than spring 50.

A tone hole pad 62, adapted to be lifted by spatula 64 to play high D, is engaged by an 70 arm 66 on a hinge 68 having a second arm 70 engaging a wiper 72 on a hinge 74. The hinge 74 is urged in the direction of the arrow by a spring 76 and carries a crank arm 78 which engages a lever 80 pivoted on the mouthpipe at 75 82. The lever 80 carries the pad which closes

the octave hole 28 and is urged by a spring 84 in a direction to close the octave hole.

A wiper 85 integral with the arm 80 between the respective hinges 58 and 82 of the arms 56 and 80 engages the arm 56, when it is in the 5 position it occupies when octave hole 30 is open, in such a manner that if arm 80 is moved in the direction to open the octave hole 28, the octave hole 30 will be positively closed.

Octave hole pads 32 and 34 are each hinged 10 on an axle 86 and are interconnected by a floating lever 88 pivoted at its center on an arm 90 hinged on the axle 86 and one end of which is engaged by the arm 44. The other end of the arm 90 is engaged by a bridge rod 92 hinged 15 on the axle 86 and carrying a fingertip 94 which is depressed whenever middle or high G, is played. The bridge rod 92 is urged by a spring 96 in a direction to depress the floating lever 82 and hold both octave holes 32 and 34 closed. 20

A wiper arm 98 mounted on a hinge 100 and urged in the direction of the arrow by a spring 102 engages the floating lever 88 below its pivot. The spring 102 is insufficient in strength to overcome the spring 96 and lift the octave hole 25 pads.

The lower and middle E tone hole pad 104 is mounted on a hinge 106 having a wiper arm 108 engaging another wiper arm 110 on a long axle 112 which is urged by a spring 114 in the direc- 30 tion of the arrow. On the long axle 112 is an arm 116 engaging an arm 118 secured to a bridge rod 120 hinged on the axle 86. An arm 122 secured to the upper end of the bridge rod 120 engages a projection 124 on the arm of 35 the octave hole pad 34. Through these interconnections, it will be noted that the spring 114 serves to hold the octave hole 34 closed.

The tone hole pad 104 is provided with a finger tip 125 which is always depressed to sound either 40 lower or middle D# and all notes below.

A crank arm 126, connected to the bridge rod 92, passes underneath the arm 90 and under an arm 128 on the hinge 48 at a distance therefrom (see Figure 6) which permits the hinge 48 45 to rotate in the direction of the arrow sufficiently to open the octave hole 30 before engaging it.

When the instrument is played in the lower register, the thumb of the player's left hand rests on the thumb rest 38 and spring 42 acting 50 through arm 44 overcomes the tendency of spring 50 to open the octave hole 30, and the engagement of arm 44 with arm 90 prevents spring 102 from lifting the floating lever 88 and thereby opening either of the octave holes 32 or 55 34. Therefore, the depression of either of the fingertips 94 or 125 in playing any of the lower register notes, although the pressure of springs 96 and 114 is thereby relieved, has no effect on the octave holes. 60

When playing in the upper register, spatula 36 is depressed as in the standard instrument. This raises the arm 44 from the wiper 46 permitting the spring 50 to rotate the crank arm 52 and open the octave hole 30. It will be noted 65 that when this occurs, arm 128 moves into engagement with crank 126. Depression of spatula 36 also raises arm 44 from arm 90. In this condition the notes upper C#, C, B and A# may be played, but if any note below A# is played, fingertip 94 must be depressed and, when this occurs, the force of the spring 96 is relieved from the arm 90 permitting the spring 102, through lever 90, to raise the floating lever 88. Since spring 114 is still acting on the octave hole pad 34 75

through the lever 122 and the projection 124 the floating lever 88 will pivot about the pad 34 and raise the octave hole pad 32. At the same time the crank 126 is raised bringing the arm 128 back to its original position and permitting the octave hole 30 to close. In this position the notes middle G#, G, F#, F and E may be played.

In order to go below these notes pad 104 must be depressed by fingertip 125. This relieves the force of spring 114 on the octave hole pad 34, and since arm 98 acts below the pivot of the floating lever 88, the floating lever will be swung about its pivot closing the octave hole 32 and opening the octave hole 34. In this position middle D# and D may be played. As previously stated middle C# may also be played by closing the D tone hole instead of by releasing spatula 36 and opening all of the tone holes as described above, and as is now the usual fingering.

For playing upper F, E, D# and D while spatula 36 is depressed, it is only necessary to raise the D tone hole pad 62 by depressing spatula 64. This swings the arm 78 against the force of the spring 76, rotating the lever 80 in a counterclockwise direction (see Figure 7), opening the octave hole 28, and closing octave hole 30 by means of the wiper 85 previously described.

It is theoretically possible that, if fingertip 94 or 125 were depressed while spatula 64 is depressed, octave hole 32 or 34 would open, but this could only happen by accident and would never occur if the instrument is played in the usual manner with the standard fingering.

While only one illustrative embodiment of the invention has been shown and described in detail, it is not my intention to limit the scope of the invention thereto or otherwise than by the terms of the appended claims. This application is a division of my copending application Serial No. 116,948 filed December 21, 1936.

I claim:

1. A wood-wind instrument having tone holes provided with pads having operating keys and having four normally-closed octave holes provided with pads, and having an operating key associated with the octave holes, and connecting mechanism rendered operative by the octave-hole key and including separately-operable parts actuated by certain of the operating keys for the tone holes to selectively singly open the octave holes independently of each other and at the same time to close the three octave holes not so opened.

2. A wood-wind instrument comprising detachably-connected mouthpipe and branch portions having tone holes provided with pads, having operating keys and having four normally-closed octave holes provided with pads two of the octave holes being in the mouthpipe and two in the branch, and having an operating key associated with the octave holes and mounted on the branch, and connecting mechanism rendered operative by the octave-hole key and including separately-operable parts actuated by certain of the operating keys for the tone holes to selectively singly open the octave holes independently of each other and at the same time to close the three octave holes not so opened, the connecting mechanism being mounted partly on the branch and partly on the mouthpipe.

3. A wood-wind instrument comprising a generally tubular body formed with tone holes provided with pads having operating keys, two octave holes having pads connected with a floating lever, an octave-hole key to lift said lever about

one end or the other of said lever, connections from certain of the keys associated with the tone holes to determine which end of the floating lever is lifted by the octave hole key, two other octave holes having pads, means actuated by certain others of the keys associated with the tone holes for closing both of the first two octave holes and yieldingly opening one of said two other octave holes and means actuated by another of the keys associated with the tone holes for forcibly closing the yieldingly-opened octave hole and at the same time opening the other of said two other octave holes.

4. A wood-wind instrument comprising a generally tubular body comprising branch and mouthpipe sections which are detachably connected, and formed with tone holes provided with pads having operating keys, a first pair of octave holes formed in said branch section and having pads connected with a floating lever, an octave-hole key to lift said lever about one end or the other of said lever, connections from certain of the keys associated with the tone holes to determine which end of the floating lever is lifted by the octave hole key, a second pair of other octave holes formed in the mouthpipe section and having pads, means actuated by certain others of the keys associated with the tone holes for closing both of the first two octave holes and opening one of said second pair of octave holes and means actuated by another of the keys associated with the tone holes for closing the octave hole so opened and at the same time opening the other of said second pair of octave holes.

5. A wood-wind instrument comprising a generally-tubular body including detachably connected mouthpipe and branch sections, said branch section having tone holes provided with pads and having two octave holes provided with selectively operable pads and with key-actuated mechanism for operating said pads, and said mouthpipe section having two octave holes provided with pads, in combination with levers carrying said pads for the octave holes on the mouthpipe section and which are arranged on opposite sides of the mouthpipe section and which interengage with the key-actuated mechanism substantially at the joint between the two sections.

6. A wood-wind instrument having tone holes provided with pads having operating keys and having four octave holes, said instrument adapted to play throughout a range of at least three octaves, pads for normally closing said octave holes for playing in the lower register, an octave key, and mechanism controlled jointly by said octave key and by preselected groups of the operating keys for singly selectively opening said octave holes.

7. A wood-wind instrument having tone holes provided with pads having operating keys and having four octave holes, said instrument adapted to play throughout a range of at least three octaves, pads for normally closing said octave holes for playing in the lower register, an octave key, mechanism controlled jointly by said octave key and selected groups of the operating keys for singly selectively opening two of said octave holes, a control key, and means controlled jointly by said octave key, selected groups of the operating keys and the control key for closing said two of the octave holes and singly selectively opening the other two octave holes.

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