

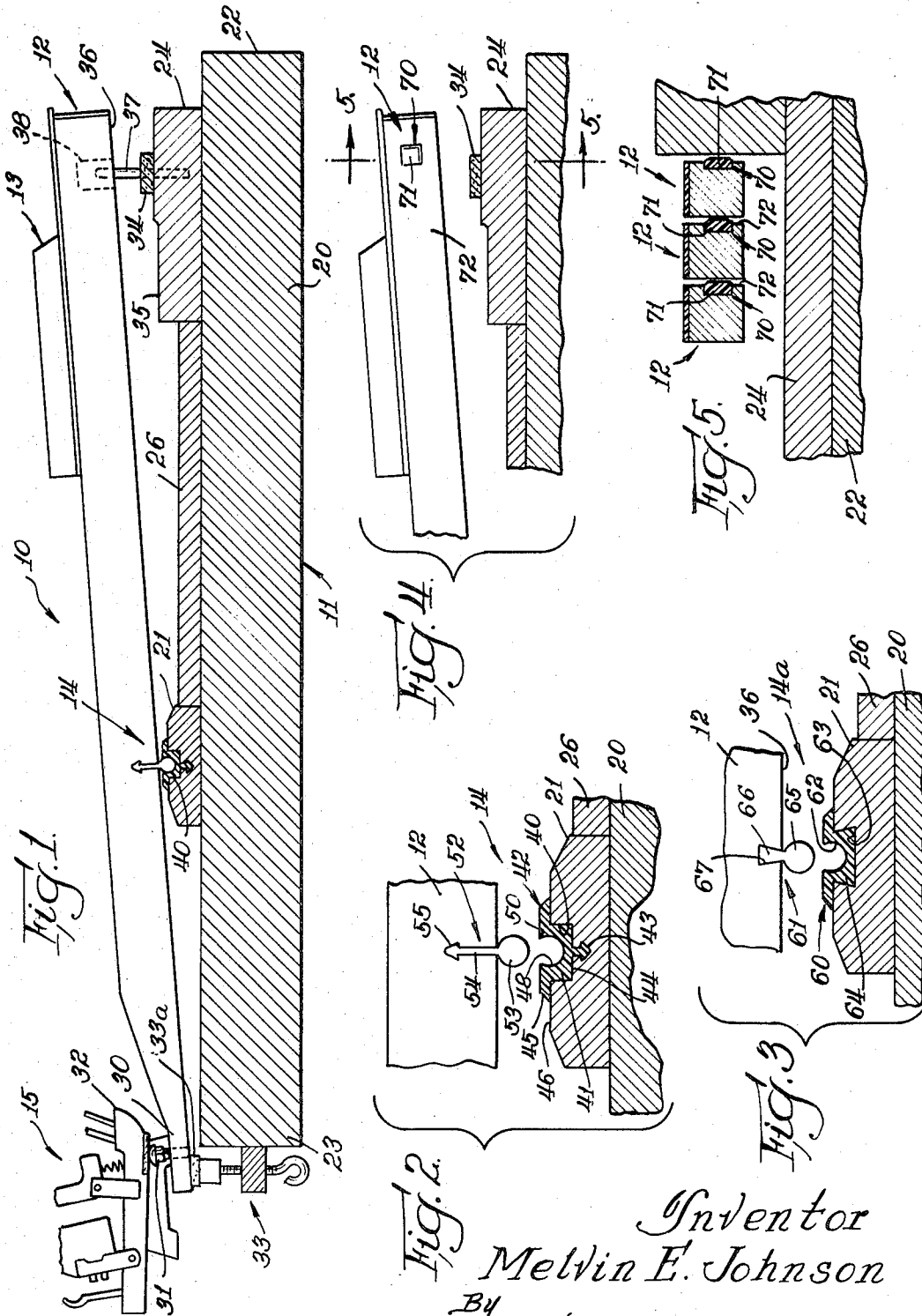
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KEYBOARD ASSEMBLY

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KEYBOARD ASSEMBLY

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ABSTRACT OF THE DISCLOSURE

A keyboard assembly for pianos, organs and similar musical instruments having individual keys pivotally connected to an underdisposed balance rail by pivot connectors having detachable interfitting cooperating parts, one part of which is connected to the balance rail and is common to all keys while each key carries another part constituting a segment of an elongated member anchored to the underside of a fabricated key blank and tailored into a plurality of segments individually related to and formed simultaneously with the manufacture of keys from the key blank.

This invention relates generally to musical instruments and more specifically to improvements in keyboard assemblies for pianos, organs and the like and to an improved method of manufacturing the same.

In accordance with presently recognized practice, keyboard assemblies for pianos and the like, have generally constituted subassembled units made up of an elongated rectangular undersupport bed carrying on the upper face thereof a front rail extending generally along the frontal edge of the bed and paralleled by a balance rail disposed intermediate the front and back edges of the bed. A plurality of operating keys are generally cut from a rectangular key blank fabricated of wood and "ivory" to provide a set of elongated keys of various shapes and forms for cooperating side by side operation; such keys constituting first class levers mounted on the balance rail as a fulcrum. Connection between the individual keys and the balance rail is generally effected, according to previous practice, by one or more balance key pins projecting upwardly from the balance rail and receivable in suitable slots or openings formed through an overlying key. One or more additional front key pins usually project upwardly from the front rail and enter over-disposed openings formed inwardly of the bottom surface of the individual keys beneath the usual finger engaging surfaces thereon. In such known structures, the keys reside loosely on the balance and front key pins and therefore may be readily removed therefrom after detachment from suitable action mechanisms mounted adjacent the non-finger engaging ends of the keys whereby the action mechanisms operatively respond to the rocking action of the keys about the balance rail fulcrum. Such a mounting system for the keys gives rise to several recognized difficulties. In the first instance, the provision of one or more openings through the individual keys both intermediate the ends thereof and adjacent the outer playing or finger engaging ends thereof materially reduces the strength and integrity of the key members and leads to difficulties in key alignment unless the openings and pins are carefully related. Of equal seriousness, is the laborious and time consuming practice of assembling the several balance key pins and front key pins in both the rails of the keybed support required to pivotally mount, align and guide the movement and activity of the several individual keys as above explained.

The present invention is addressed to alleviating the above and other difficulties and shortcomings of pre-

viously known keyboard assemblies as well as to methods of manufacturing the same. Briefly, this invention concerns a new and simplified means for pivotally interconnecting the individual keys to underlying key bed support therefor and a novel method of producing the same. The connector means comprise readily detachable male and female interfitting parts of which one part is connected to each key of the assembly and the other part is fitted to the balance rail and is common to all keys thereof. Significantly, the parts of the pivotal connector means carried by the individual keys constitute segments of an elongated member which is affixed as a unit, to a generally rectangular fabricated wood key blank prior to cutting such blank into a cooperating set of matched individual keys. Such elongated member is accordingly severed into segments tailored to the dimensions and shape of each individual key, simultaneously with the formation or cutting of each key from the key blank. Means are also provided for assuring positive regulated spacing between adjacent keys in final assembly, either by utilizing the familiar front key pins associated with the front rail of the key bed support or by providing suitable guide means between adjacent keys.

A general object of this invention is to provide a new and improved keyboard assembly for pianos, organs and like musical instruments.

Another important object of this invention is to provide a keyboard assembly as aforesaid comprising improved means for pivotally connecting movable keys thereof to the balance rail of the keybed support.

Still another object of this invention is to provide new and improved pivotal connector means for attaching keys of a piano keyboard assembly to an underlying balance rail therefor, in a manner permitting ready detachment and removal of the individual keys from the assembly as selected.

A further important object of this invention is to provide a new and improved method for manufacturing and assembling a piano keyboard assembly and the like.

A still additional object of this invention is to provide an improved keyboard assembly for pianos and similar musical instruments which is productive of improved economies of manufacture and assembly.

Having thus described the present invention, the above and further objects, features and advantages thereof will appear from the ensuing description of a preferred embodiment and modifications of this invention, as illustrated in the accompanying drawings.

In the drawings:

FIGURE 1 is a side elevational view of a keyboard assembly according to this invention;

FIGURE 2 is an enlarged partial view of the pivotal connector means illustrated in the FIGURE 1 assembly showing the cooperating parts thereof separated ready for interconnection;

FIGURE 3 is an enlarged view similar to FIGURE 2 illustrating a modified form of the pivotal connector means;

FIGURE 4 is a partial side elevational view of a piano keyboard assembly of the order illustrated in FIGURE 1 showing the outer or playing ends of the piano keys fitted with key guiding and spacing means; and

FIGURE 5 is a cross-sectional view taken substantially along vantage line 5—5 of FIGURE 4 and looking in the direction of the arrows thereon.

Turning now to the drawings, FIG. 1 illustrates a piano keyboard assembly, indicated generally by numeral 10, according to the present invention. As therein shown, such assembly comprises a planar keybed support 11, a plurality of piano keys such as keys 12 and 13 mounted over the support 11 and pivotally joined thereto by con-

nector means 14 for pivotal activity as first class levers to actuate conventional piano action means 15.

The key bed support 11 comprises, according to recognized practice, planar bed plate 20, usually fabricated of laminated wooden strips to effectuate a generally rectangular rigid support member. In some instances, the bed plate 20 is made in the form of an open rectangular frame. In either event, it is essential to the successful operation of a keyboard assembly that the supporting bed therefore be substantially rigid and provide a generally horizontal platform for a balance rail 21 extending lengthwise thereof. As shown, rail 21 is formed as an elongated wooden member mounted substantially medially of the front-to-back dimension of the bed plate 20 and in spaced parallelism with its front and back edges 22 and 23. A similar wooden front rail 24 is mounted to extend lengthwise of the bed plate 20 immediately adjacent the leading edge 22 thereof and in spaced parallelism with the intermediately located balance rail 21. Suitable reinforcing blocks 26 are usually glued up with bed plate 20 to extend between the two rails 21 and 25 to rigidify and strengthen the support structure.

The plurality of individual key members 12 and 13 are mounted over the keybed support 11 as first class levers utilizing the balance rail 21 as the medial fulcrum therefor; such keys comprising elongated members extending generally between the front and back edges 22 and 23 of the bed plate 20 in a conventionally known fashion. It will be noted that the keys 12 and 13 along with additional keys (not herein illustrated) are interjoined with the balance rail 21 by the pivotal connector means 14 as will be described in greater particular presently. Further the rearward or innermost end of each such key is necked down to provide a short tongue portion 30 carrying adjustable screw means 31 for engaging actuating lever means 32 of a conventional action mechanism 15 in the particular embodiment herein shown. In known fashion, hammer members (not illustrated) are caused to strike strings of the piano or similar instrument in response to operation of the action means 15, initiated by depressing the outer ends of a key member to pivot or rock the same about the balance rail 21, according to recognized practice. It is to be noted that the tongue portion of each of the key members is adjustably spaced from the upper surface of the bed plate by intervening adjustable key positioning means 33, carrying felt bumper stops 33a for engaging the underside of the tongue portions 30 as set out in my application Ser. No. 434,783, filed in the United States Patent Office on Feb. 24, 1965. Similar front bumper stops or felts 34 are provided between the top surface 35 of the front rail and the bottom surface 36 of each key. In the particular illustrated embodiment set out in FIG. 1, front key pins 37 extend upwardly from the front rail 24 and are received in hollowed out sockets 38 extending inwardly of the bottom surface 36 of each key in a known manner. Such pins 37 are generally rigid cylindrical metal members and the front bumper stops 34 are normally mounted thereabout and glued to the upper face of the front rail 24.

Referring now particularly to FIGS. 1 and 2 of the drawings, the detailed aspects and features of the connector means 14 will now be described. As best shown in FIG. 2, the balance rail 21 is provided with a longitudinally extending and medially located kerf or slot 40 of substantially rectangular cross-section which matingly receives an elongated body portion 41 of a female connector member, 42 preferably extruded or molded resilient plastic material, such as nylon or the like. It will be noted that the body portion 41 of the member 42 is formed integrally with a barbed anchor means or portion 43 depending centrally from the bottom thereof and which is driven into a central slotted opening provided therefor along the bottom of the slot 40 cut in balance rail 21. On its upper side, the body portion 41 of member 42 is

formed integrally with a pair of flanking flange portions 45 which extend laterally outwardly of the side limits of slot 20 in assembly to overhang the upper face 46 of the balance rail 21. Body portion 41 is further distinguished by a longitudinally extending and centrally located socket groove 48 of arcuate cross-section of uniform radius. The groove 48 is open along its upper side providing a slotted throat bounded by parallel opposed lips 50, 50 formed integrally with flange portions 45. It is to be noted that the distance between the lips 50, 50 is somewhat less than the greatest width or diameter of the socket 48 for purposes which will appear presently.

It will be understood that an assembly the elongated connector member 42 is inserted into the slot or kerf 40 formed for that purpose in the upper face of the balance rail and preferably is forced into its mounted position with the barbed anchor means 43 penetrating deeply into the body of the balance rail 21 to lock member 42 positively in position.

Each of the keys 12 and 13 of the keyboard assembly is fitted with a male pivotal connector member 52 intermediate its ends and projecting outwardly of lower face 36 thereof. Such members 52 comprise sections or portions of an elongated extruded nylon or similar plastic strip member having a cross-sectional configuration generally of the order illustrated in FIG. 2. From such figure, it will be seen that the member 52 has male bead portion 53 at its lower end having a generally cylindrical cross-section to matingly fit into the socket groove 48 of member 42 (see FIG. 1). The bead portion is integrally related with a substantially rectangular cross-sectioned stem portion 54 extending outwardly from one side thereof and formed with anchoring means comprising a barbed portion 55 at its outer end in the illustrated structure. In assembly, the body of the key member, such as key 12, is provided with a suitable medially transverse slot, formed as by a sawcut, into which the stem 54 is pressed or driven; the anchor means 55 thereon serving to lock such member in place. In order to simplify this procedure the pivot member 52 associated with each of the keys of the assembly preferably constitutes a segment or linear section cut from an elongated member of like cross-sectional configuration which is preferably mounted as a unit on the underface of a planar fabricated key blank prior to cutting the same into a plurality of mating or matched keys. This operation is best performed simply by providing a longitudinally extending sawcut at the desired location along the bottom face of the key blank into which the stem portion 54 of the member 52 is inserted, usually under pressure. Thereafter the several adjacent keys are cut from the key blank in a known manner as by a band saw or the like. It will be appreciated that with such a procedure the individual segments or sections constituting the individual pivot member 52 are simultaneously severed and individually tailored to each key as it is cut from the blank. In this latter respect, it will be understood by those familiar with this art that the formation of a matched set of keys from a wooden blank conventionally results in the elongated bodies of the several keys having a variety of shapes, thicknesses and configurations. Thus, the elongated pivot member mounted on the key blank is accordingly tailored or severed into pivot members 52 of various lengths matching the varied dimensions of the individual keys. When assembling all of the keys of a matched set, cut from a given blank, the several pivot members 52 associated with and anchored to the individual keys, according to the concepts and teachings of this invention, reside in a colinear alignment. This feature defines a common pivot axis for all keys of the keyboard assembly and determines proper registering alignment thereof, without adjustment, when mounting the keys on the balance rail by simply inserting the semi-cylindrical end portions 53 of each member 52, into the socket groove or channel 48 provided in the cooperating pivot member 42. It will be understood that the yieldable nature of the

nylon or other plastic material employed for the connector members 42 and 52, readily permits the bead portion 53 of the male pivot member to yieldingly part the lip portions 50, 50 on the female pivot member when entering socket channel 48. Thereafter such lips 50, 50 spring back to normal positions and thereby serve to removably lock the bead portions 53 in the channel 48, providing detachable connection of the keys to the balance rail 21.

In FIG. 3 of the drawings, a modified pivot connector means 14a is illustrated. As will be recognized from examining that figure, connector means 14a is substantially identical to the connector means 14 hereabove described except for the system or means utilized therein for anchoring the cooperating pivot members 60 and 61 thereof to the balance rail 21 and piano keys respectively. Briefly, it will be appreciated that the female connector strip 60 is formed with a lengthwise extending arcuate shaped slot 62 opening along its upper side and identical to slot 48 in member 42 above-described. Member 60 is otherwise constructed substantially as member 42 with the exception that the anchor means 43 of the latter member has been eliminated from member 60 and alternate means for anchoring the same in lengthwise extending slot or kerf 63 of the modified balance rail 21 has been provided. In this regard, it will be appreciated that the slot or kerf 63 in the balance rail is formed with a substantially trapezoidal shaped cross-section having downwardly diverging side walls. Accordingly, the body portion 64 of the pivot member 60 is modified to conform with slot 63, therefore having a trapezoidal cross-section with side walls thereof flaring outwardly in diverging relationship to mate with the corresponding side walls of the modified slot 63 in the balance rail. By this system a dovetailed interconnection between the pivot member 60 and the balance rail 21 is brought about to interlock such members.

In a similar fashion, the modified male pivot member 61 of the pivot means 14a bears the generally cylindrical cross-sectioned bead portion 65 located beneath the lower face 36 of key member 12 in assembly for mating interfitted relationship with the socket or slot 62 of the female pivot member 60 in the manner described heretofore with respect to corresponding pivot members 52 and 42 of assembly 14. Anchoring of the pivot member 61 to a key such as key 12, shown in FIG. 4, however, is accomplished by means of a trapezoidal shaped dovetail projection or portion 66 of member 61, which is registeringly or matingly received in a corresponding shaped slot 67 formed transversely across each key and inwardly of the bottom face 36 thereof.

Thus, with respect to both of the modified pivot members 60 and 61, it will be appreciated that the same are substantially identical to members 42 and 52 heretofore described with the exception of the means for anchoring the same to the respectively associated balance rail and key members of the assembly as described.

While the hereinabove described preferred and modified forms of connector means 14 have been set forth and illustrated with the male connector members mounted on the playing keys and the female connector members anchored in the balance rail, it is fully contemplated that such members may be reversely related. That is to say the male member of the connector means may be mounted on the balance rail to enter a female connector member on the several keys, with equal effectiveness.

It will be recalled that in assembly 10 illustrated in FIG. 1, the leading or playing ends of the several keys 12 and 13 thereof are guided and held in predetermined laterally spaced relationship by virtue of the conventional front key pins 37 which enter the opening 38 according to known practice in this art. It is to be recognized however, that the axial length of the several individual pivot members 52 or 61, and particularly the cylindrical bead portions 53 or 65 as above-described, materially assists in stabilizing the elongated key members against lateral movement substantially preventing any pivoting or rota-

tion thereof about a generally vertical axis. Nevertheless, it is felt desirable that some type of guiding means, such as the illustrated conventional front rail key pins 37 be employed to generally enhance lateral stability of the several keys. As an alternate to the conventional guiding pins 37, novel guiding and spacing means 70 are employed according to the teachings of the present invention (see FIGS. 4 and 5). Means 70 are preferred to the pin and slot system illustrated chiefly in FIG. 1 because of obvious production economy and simplicity and further because the integrity and strength of the several keys is maintained by avoiding formation of the pin receiving openings 38 therein.

Specifically and with reference to FIG. 4 of the drawings, it will be appreciated that the modified guiding and spacing means 70 referred to above comprises a plurality of spacer buttons 71 mounted on corresponding faces 72 of each of the key members and preferably adjacent the outer playing end thereof in the general zone adjacent the front bumper stops located on the front rail 24 of the assembly. As shown best in FIG. 5 of the drawings, such spacer blocks 71 may comprise small quadrangular buttons of "ivory" or other suitable plastic material, such as nylon, protruding outwardly of the faces 72 of the keys. The blocks may be glued directly on such surfaces or preferably, as illustrated in FIG. 5, the same may be inset in appropriate registeringly shaped sockets therefor extending inwardly of the surfaces 72. With this system, the presence of the several blocks 71, 71 between adjacent keys serve to maintain the outer ends of the keys in desired lateral spaced relationship throughout the operating movements of the several keys.

I claim:

1. A keyboard assembly of the class described comprising an elongated planar keyed support having an elongated linear balance rail extending lengthwise along an upper face thereof and projecting upwardly therefrom, a plurality of elongated keys mounted transversely over said rail and operable thereabout as first class levers, pivotal connector means between each of said keys and said rail comprising a unitary first connector member extending along the upper face of said rail beneath all of said keys, and anchored thereto, and a plurality of second connector members, one attached to the underside of each of said keys in opposing alignment with said first member, said first and second members having matingly engageable, semi-cylindrical male and female portions defining a single common pivotal axis for said keys when interconnected, action means mounted adjacent and connected to one end of each of said keys and operatively responsive to pivotal movement thereof about said pivot axis, and means associated with each of said keys for maintaining predetermined lateral spacing therebetween.

2. The combination as set forth in claim 1 where said first and second members are formed of resiliently yieldable material whereby said male and female portions thereof may be matingly interfitted and detachably interlocked.

3. The combination of claim 1 wherein said first member is formed with an elongated female socket of semi-cylindrical cross-section extending lengthwise therealong and opening inwardly of the upper side thereof, and each of said second members if formed with a semicylindrical male portion projecting beneath and extending laterally across the lower face of each of said keys for mating reception in said socket of said first member.

4. A keyboard assembly of the class described comprising an elongated planar keyed support having an elongated linear balance rail extending lengthwise along an upper face thereof and projecting upwardly therefrom, a plurality of elongated keys mounted transversely over said rail and operable thereabout as first class levers, pivotal connector means between each of said keys and said rail comprising a first connector member extending along the upper face of said rail and beneath all of said

keys, and a plurality of second connector members, one attached to each of said keys in opposing alignment with said first member, said first and second members having mating male and female portions defining a common horizontal pivotal axis for said keys, action means mounted adjacent and connected to one end of each of said keys and operatively responsive to pivotal movement thereof about said pivot axis, and means for maintaining predetermined lateral spacing between keys comprising spacer guide means mounted on one side face of each of said keys and projecting uniformly outward thereof.

5. In a keybed assembly for pianos and like musical instruments having a generally planar keybed support carrying an intermediate balance rail and a plurality of elongated keys mounted over said rail for pivotal operation thereabout as first class levers and adapted to operate conventional action means connected to one end of each said key, improved means for detachably interconnecting said keys to said rail comprising: an elongated member mounted along the upper side of said balance rail and including means anchoring the same thereto, and a plurality of other members mounted one on the underface of each of the several keys of the assembly each in coterminating relation with the lateral dimension of its respectively associated said key; such elongated and other members having mating semicylindrical male and female portions whereby the same are detachably interconnectable and define, when interconnected, elongated pivot means joining said keys to said rail for restricted arcuate movement about a single common axis.

6. The combination of claim 5 wherein said members on said keys comprise linear segments of a unitary elongated member anchored on the bottom face of a key blank and severed into such segments simultaneously with an

according to the cutting and forming of keys from said blank.

7. A method of manufacturing pivotal connector means for attaching keys to the balance rail of a keybed in a keyboard assembly for a musical instrument such as a piano, comprising the steps of: anchoring an elongated first connector member longitudinally along the upper face of the keybed balance rail, anchoring a second elongated member lengthwise along the bottom face of an uncut key blank in position for opposing alignment with said first member in assembly, said two members having mating male and female portions definitive of a single pivot axis when mated, cutting a set of matching keys from said blank and simultaneously severing said second member into a corresponding set of linear segments, one segment being related to and matched with the lateral dimension of its respectively associated key and adapted when interconnected with said first member to effect pivotal interconnection of said keys and rail.

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