April 1, 1952 R. D. CHARLESWORTH 2,590,935

LOUD-SPEAKER MADE FROM SEPARATE UNITS HAVING LOCKING RING SECURING UNITS TOGETHER

Filed Aug. 28, 1948 3 Sheets-Sheet 1

FIG. 1.

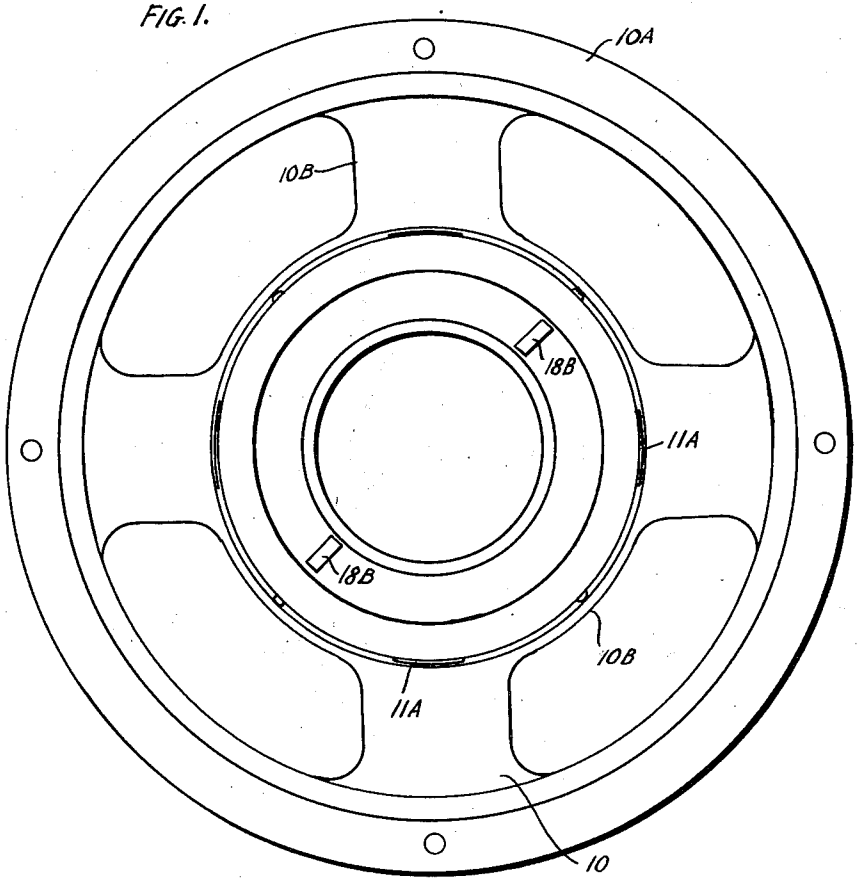
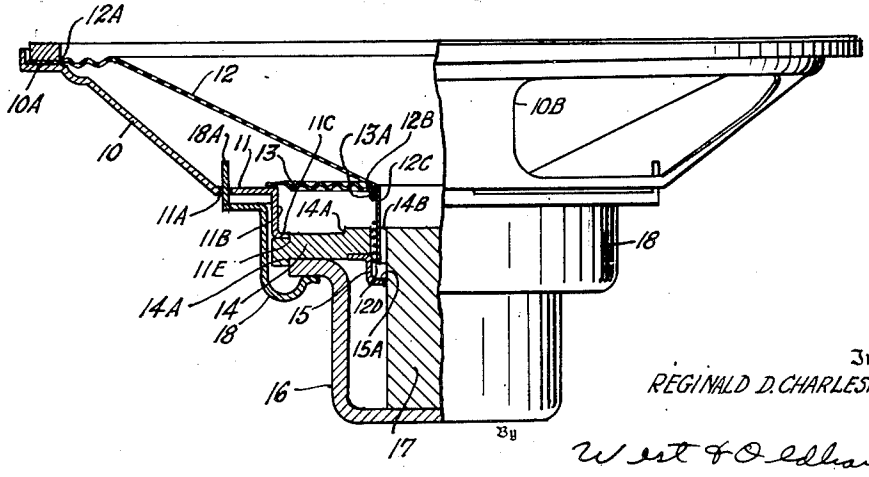


FIG. 2.



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FIG. 3.

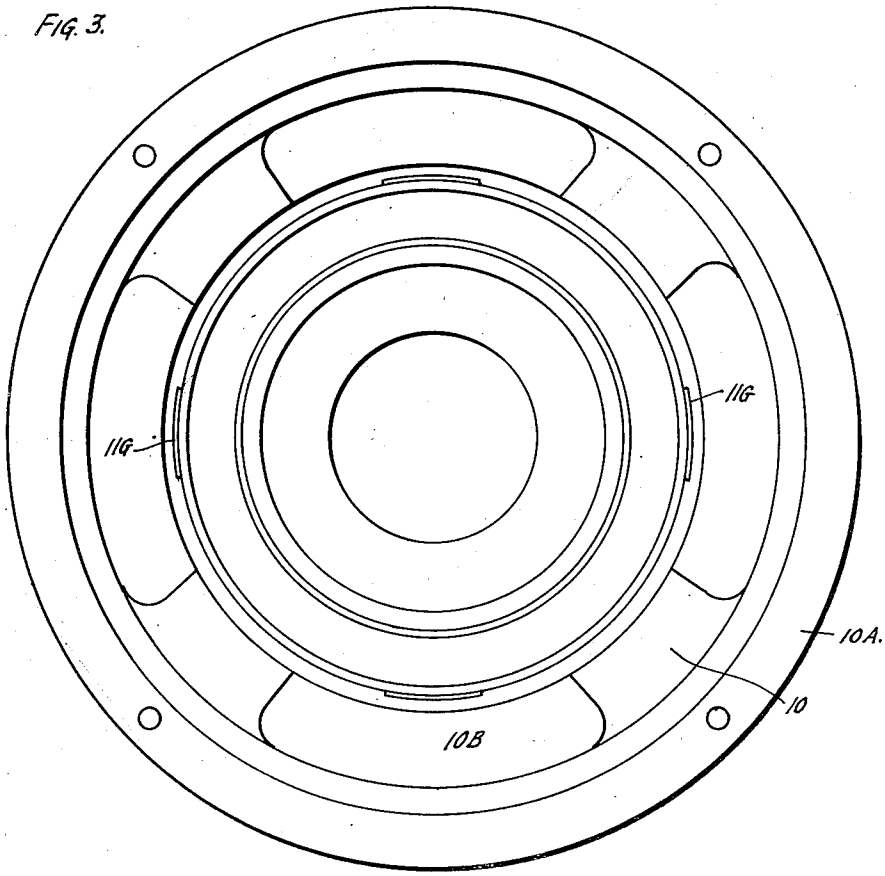
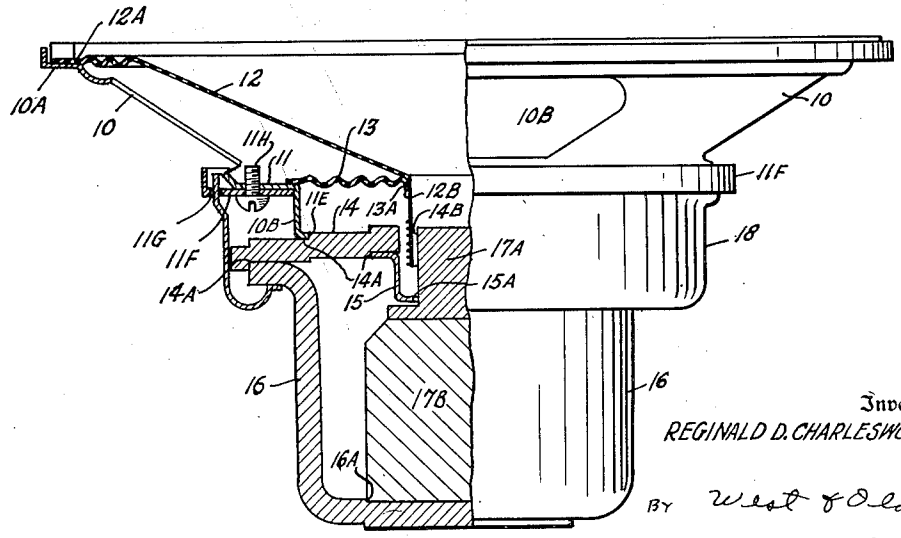


FIG. 4.



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FIG. 5.

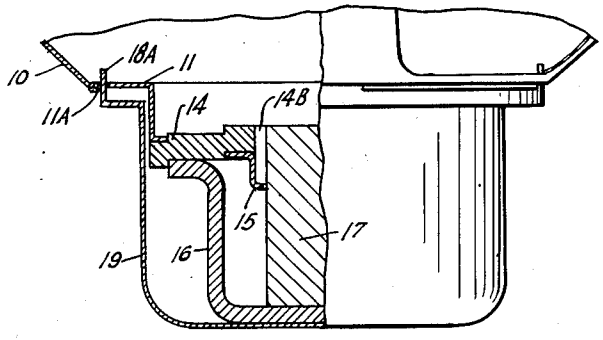
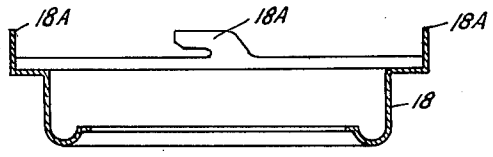


FIG. 6.



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LOUD-SPEAKER MADE FROM SEPARATE UNITS HAVING LOCKING RING SECURING UNITS TOGETHER

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12 Claims. (Cl. 179—115.5)

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This invention relates to improved methods and improved means whereby loud speakers, of the moving coil type in which a diaphragm carrying a voice operating in a magnetic air gap, are formed of independently constructed separate units which are adapted to be readily and positively assembled; and in which demounting for inspection, cleaning, repair or replacement and re-assembly in positive and accurate relationship to each other is performed without the use of separate gauges, jigs or special or precision equipment.

These improved methods and means allow the various units of which the loud speaker is constituted to be completely interchangeable between one speaker and another of the same construction, the units themselves providing the features necessary to obtain correct and accurate alignment in assembly without the employment of gauges, jigs or the like.

In the preferred methods of assembly of the units of the loud speaker we aim to produce the speaker as built up of two inter-related and co-operative units, each of which has no operative part of the other. These units comprise a diaphragm assembly unit including an outer housing, a diaphragm, a voice coil former and voice coil, and a spider; and a magnetic unit assembly including a top plate formed with positioning and nesting means and fitted with an orifice in the plate with a detachable floating central pole piece, and a magnet pot or the like encasing said central pole. Locking members of independent construction are provided for detachably locking the two units in correct operative relation to each other.

Each of these units is assembled separately for storage or immediate use without embodying any operative portion of the other unit, and are assembled in co-operative and detachable relation to each other without the use of independent or separate special gauges or the like to produce an efficient loud speaker.

In this invention the top plate of the magnetic unit, as by extrusion pressure, or other methods, is provided or formed on its upper and lower surfaces with positioning and nesting means in the forms of right angled continuous or non-continuous steps, recesses, bosses, or the like, making broken surfaces on the plate. These positioning and nesting means are used to locate correctly the diaphragm assembly unit on the upper surface of the top plate and the magnetic unit on the lower surface of the top plate.

An orifice is formed in the plate in relation

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to the positioning and nesting means and its walls are adapted to define and limit the outer boundary of the air gap in which the voice coil operates.

Preferably nesting in a locating means on the under surface of the top plate is a non-magnetic ring that is adapted to be secured to the top plate as by riveting, peening, or similar process. This ring has an aperture or smaller diameter than that of the orifice in the top plate and is concentric therewith. This aperture is adapted to make a close fit about a detachable central pole which may be in the form of a floating magnetic slug and is adapted to make magnetic contact with another floating pole piece of magnetic material that may be nested in a recess in the base of the magnet pot. On magnetic energisation of the magnetic slug the parts of the unit are held in operative relation to each other by the magnetic flux.

The diaphragm assembly unit is assembled as a complete independent unit by aid of gauges.

A diaphragm housing, of frustro-conical, or elliptical form and formed of metal, pressed or die cast, or of other stiff and relatively rigid material, such as moulded plastic, open at each end and provided with windows or similar apertures on its side walls, has its larger outer end rimmed to support the outer edge of the diaphragm to be used.

The housing side walls are formed or provided with an internally extending flat ledge or shelf of any desired width and this shelf terminates in a, preferably, right angled rearward extension of any desired shape, length and diameter; the rear end of this extension is formed or provided with a base or floor of any desired width that is provided or formed with an accurately placed aperture of circular oval, square, rectangular or other desired shape. This aperture is adapted to positively co-operate detachably with a magnetic unit of the loud speaker to be formed.

An external outwardly extending flat member or shelf may be formed or detachably provided on the outer walls of the housing, and preferably, is secured to the outer flat ledge on the housing side walls. The internal and external shelves are provided with part locking means for co-operation with the locking members for the two units.

The diaphragm is formed of paper or other suitable material and may be of similar shape to that of the diaphragm housing. Its larger outer end is formed with a rim that fits on the housing outer rim, and has its lower or apex end pro-

vided with a downwardly extending neck that is concentric with the outer end of the diaphragm and is adapted to carry a voice coil former, voice coil and spider.

The spider is of disc form with a central open neck and is, preferably, corrugated. Its outer edge is adapted to be secured to the inner shelf of the housing inside the part locking means on the shelf.

To position and secure the spider I employ a gauge that has a lower ring that fits accurately within the aperture in the housing floor. A central detachable upstanding boss above the gauge ring is adapted to fit accurately the neck of the spider thus locating its position, then the outer edge of the spider is pressure cemented or otherwise secured to the inner flat shelf of the housing.

The central boss may be removed and replaced by a boss of smaller diameter than that of the spider gauge boss or a similar gauge with the smaller central detachable boss is employed to fit accurately the voice coil former when the latter, attached to the diaphragm, is pushed through the spider neck. This smaller boss positions the voice coil former and permits the spider neck to be secured to the diaphragm neck and the outer rim of the diaphragm to be secured to the housing rim. The gauge in each case is inserted from the rear of the housing and diaphragm.

The preferred forms of locking member for locking the magnetic unit physically to the diaphragm assembly unit consist of a metal or the like pot, casing, collar, band or ring that is adapted to encircle the magnet pot and to extend upwards to lie close to the diaphragm housing. One portion of the locking member has an inturned lip or the like to engage a flange on the pot, and the other end of the locking member is provided with a series of bayonet tongues to co-operate with the slots in the inner or the outer shelves on the diaphragm housing. When a magnet pot of larger diameter than the normal sized pot is used with a correspondingly larger top plate of the magnetic unit, the outer flat ledge is fitted with an outwardly extending member provided with slots as part locking means to engage an enlarged locking member.

These slots and bayonet tongues may be substituted for each other and may be replaced by keyhole slots and expanded heads on pins or the like that co-operate with the keyhole slots, and are relatively partially rotatable into or out of locking position. The slots may be on the ledges or on the locking member, and the bayonet tongues or headed pins may be on the locking member or on the ledges.

In the accompanying drawings which illustrate several forms of construction:

Fig. 1 is a rear plan of a loud speaker;

Fig. 2 is a central part elevation and part sectional elevation of the loud speaker of Fig. 1;

Fig. 3 is a rear plan of a modified form of loud speaker;

Fig. 4 is a central part elevation and part sectional elevation of the modified form shown in Fig. 3;

Fig. 5 is a central sectional elevation of a modified form of locking member; and

Fig. 6 is a sectional elevation of a locking member showing bayonet tongues.

A diaphragm assembly unit, forming part of this invention, comprises in combination a diaphragm housing 10, formed with an outer upper rim 10A and windows or the like apertures 10B, is formed or provided on its inner side walls with a flat unchannelled ledge or shelf 11 that is provided with part locking means in the form of slots 11A, preferably arcuate in form, to co-operate with a locking member 18 to be described later for locking the units of the loud speaker in correct operative alignment with each other after assembly of the loud speaker.

Housing 10 is formed or provided with a cylindrical extension 11B on and at right angles to the edge of shelf 11. This extension may be replaced by an extension of any desired cross section, and, in each case, has a base or floor 11C of any desired width that is provided with an aperture 11E which, in the preferred form, is concentric with shelf 11 and with rim 10A of the housing, and is adapted to detachably co-operate with a magnetic unit without the aid of separate gauges or the like when the units of the loud speaker are being assembled together.

The base or floor 11C may be provided with a series of spaced holes concentrically arranged with respect to shelf 11 and rim 10A, said holes being adapted to detachably co-operate with a magnetic unit without the use of a gauge in the final assembling of the loud speaker.

An outwardly extending shelf or ledge 11F, that is provided with part locking means such as slots 11G, may be integral with the outer walls of the housing or secured as shown in Fig. 4 as by screws 11H.

A diaphragm 12 has on its outer larger end and edge or rim 12A that is secured to housing rim 10A. The apex end of the diaphragm is provided with a neck 12B concentric with rim 12A and to this neck is secured a voice coil former 12C and a voice coil 12D that projects through the aperture 11E in the housing floor.

A corrugated spider 13 is provided with a central concentric neck 13A that is adapted to be secured to the diaphragm neck 12B and has a peripheral portion or rim that is secured to the inner shelf 11.

The magnetic unit to be locked to the diaphragm assembly unit comprises a top plate 14 that has its upper and lower surfaces broken to form positioning and nesting means in the forms of steps, recesses, bosses, or the like 14A at right angles to the plate surfaces, and is provided with an orifice 14B that is located in relation to the positioning and nesting means 14A.

An inner step on the under surface of the plate is adapted to position and nest the upper end of a non-magnetic ring 15 that is formed with an aperture 15A concentric with orifice 14B but of smaller diameter. An outer step in the lower surface of plate 14 is adapted to position and nest a magnet pot, and a step on the upper surface of the plate is adapted to position and nest the diaphragm assembly unit by means of the base of the extension 11B and its aperture of spaced holes.

Within and making a close fit with the centering ring aperture (Fig. 2) is positioned a floating magnetic slug 17 that projects into the orifice 14B of plate 14 and this slug is held magnetically to the base of pot 16. In the form illustrated in Fig. 4 the front end of a mild steel tip 17A projects into and is positioned and nested by the aperture of centering ring 15 and at its rear end the tip rests on and is magnetically held to a floating magnetic slug 17B when the unit is charged magnetically. The base of slug 17B is positioned in a recess 16A in the pot base.

A locking member to secure the magnetic unit to the diaphragm assembly unit on assembling the loud speaker is shown in Fig. 2 as an encircling ring 18, the lower end of this ring bears against the upper part of the pot 16, and its upper end is, preferably, provided as shown in Fig. 6 with bayonet tongues 18A that are adapted to enter the slots in shelf 11 or shelf 11F, as the case may be, in accordance with the size of the pot and top plate. On partial rotation of the pot or of the diaphragm assembly unit, as by a tool inserted in slots 18B (Fig. 1), the locking member is brought into or out of locking position.

In the form illustrated in Fig. 5 the ring 18 is replaced by a pot shaped structure 19 which is secured to the diaphragm assembly unit and locks the magnetic unit in correct alignment with the diaphragm assembly unit.

The construction and assembling of the various parts of the two units are such that when locked by the locking member all the operative parts of each unit are retained in correct operative yet detachable alignment with each other to form an efficient loud speaker that is readily demountable for inspection, cleaning and, if so desired, replacement without the aid of external or special gauges or the like.

Having now particularly described and ascertained the nature of this said invention, and in what manner the same is to be performed, I declare that what I claim is:

1. A loud speaker of the moving coil type formed of two independently constructed and cooperative units comprising in combination, a diaphragm assembly unit having an apertured floor and a shelf portion and including a voice coil accurately positioned in relation to the aperture in said floor, a magnetic unit having a top plate adapted to removably nest with the said floor of the diaphragm assembly unit in operative relation to the magnetic unit, said magnetic unit being accurately positioned with relation to the aperture in said floor, and a detachable locking ring engaging both units and adapted to hold said units in cooperation to form a complete loud speader said ring engaging said shelf portion.

2. A loud speaker of the moving coil type formed of a diaphragm assembly unit and a magnetic assembly unit in which said magnetic unit includes a non-magnetic centering ring, a magnet pot, and a central pole formed of two parts the upper part of which is positioned in the non-magnetic centering ring with its lower surface in magnetic contact with a slug of magnetic material that is the lower part of the pole and that is housed in and in magnetic contact with the base of a magnet pot, and in which the upper part of the center pole is free to move laterally in the magnetic assembly unit.

3. In a loud speaker of the moving coil type, a diaphragm assembly unit, a magnetic assembly unit, said units having cooperating means for locating the units positively with relation to each other and including a top plate on said magnetic assembly unit, and a detachable locking ring for securing the units together and engaging a portion of said magnetic assembly unit other than said top plate.

4. In a loud speaker of the moving coil type according to claim 1 in which the locking member encompasses a peripheral portion of the magnetic assembly unit and is provided with part locking means suitably disposed to engage with cooperative part locking means that are formed

in an extension member provided on the diaphragm housing.

5. A loud speaker as in claim 2 wherein the diaphragm unit has an apertured floor and the centering ring accurately positions the central pole with relation to the aperture in the floor, and the floor of the diaphragm unit carries and accurately positions a spider, a voice coil former carried by the spider, and a voice coil carried by the voice coil former.

6. A loud speaker of the moving coil type formed of two independently constructed and cooperative units comprising in combination, a diaphragm assembly unit having an apertured floor, a magnetic unit having a top plate adapted to nest removably with the said floor of the diaphragm assembly unit in operative relation to the magnetic unit, and a detachable locking member engaging both units and adapted to hold said units in cooperation to form a complete loud speaker, said diaphragm housing being provided with an internal shelf in its side walls, said shelf engaging the outer edge of a supporting and positioning spider and a portion of said locking member, and said housing being formed with a rearward extension having an apertured floor for detachably nesting with a portion of said magnetic unit.

7. A loud speaker of the moving coil type formed of two independently constructed and cooperative units comprising in combination, a diaphragm assembly unit having an apertured floor, a magnetic unit having a top plate adapted to nest removably with the said floor of the diaphragm assembly unit in operative relation to the magnetic unit, and a detachable locking member engaging both units and adapted to hold said units in cooperation to form a complete loud speaker, said locking member comprising a locking ring having locking lugs thereon engaged with said diaphragm unit and having a radially inwardly extending portion engaging a portion of said magnetic unit.

8. A loud speaker of the moving coil type formed of two independently constructed and cooperative units comprising in combination, a diaphragm assembly unit having an apertured floor, a magnetic unit having a top plate adapted to nest removably with the said floor of the diaphragm assembly unit in operative relation to the magnetic unit, and a detachable locking member engaging both units and adapted to hold said units in cooperation to form a complete loud speaker, said locking member comprising a pot shaped member having means thereon for engagement with said diaphragm unit.

9. A loud speaker of the moving coil type formed of two independently constructed and cooperative units comprising in combination, a diaphragm assembly unit having an apertured floor, a magnetic unit having a top plate adapted to nest removably with the said floor of the diaphragm assembly unit in operative relation to the magnetic unit, and a detachable locking member engaging both units and adapted to hold said units in cooperation to form a complete loud speaker, said locking member comprises an annular member extending longitudinally of the speaker, said annular member bearing against a portion of said magnetic unit and being removably engaged with said diaphragm unit.

10. A loud speaker as in claim 1 wherein said shelf has arcuate slots therein, said locking ring has bayonet tongues extending axially therefrom, and said locking ring engages said diaphragm

unit by said tongues being extended through said slots and being moved arcuately with relation thereto.

11. A loud speaker of the moving coil type comprising a diaphragm assembly unit, a magnetic assembly unit and means for securing said units together, said magnetic unit including a top plate having nesting means formed in opposite surfaces thereof, a non-magnetic centering ring engaged with said means on one surface of said top plate, said surface of said top plate having additional nesting means formed thereon, a magnet pot engaging said additional nesting means on said surface, said diaphragm assembly unit having an apertured floor engaging said nesting means in the remaining surface of said top plate, and ring means engaging said magnet pot and said diaphragm assembly unit to secure said units together.

12. A loud speaker as in claim 2 wherein said magnet pot has nesting means formed in an inner portion thereof for engaging said slug of magnetic material to locate same with relation to said magnet pot.

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