Jan. 1, 1924 1,479,494

M. BECK

COMBINED ELECTRIC FAN AND HEATER

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Fig 1

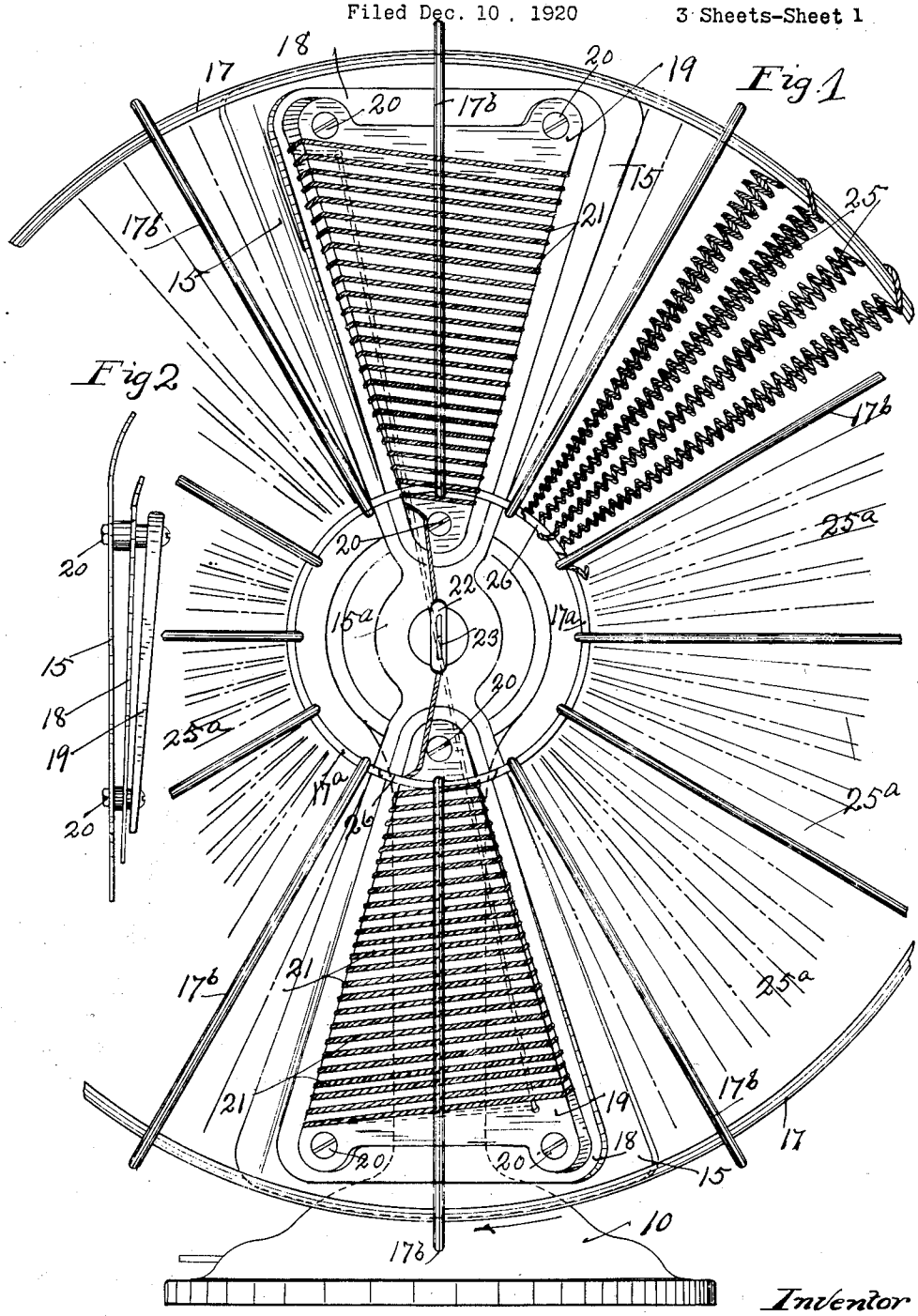


Fig 2

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Fig. 4

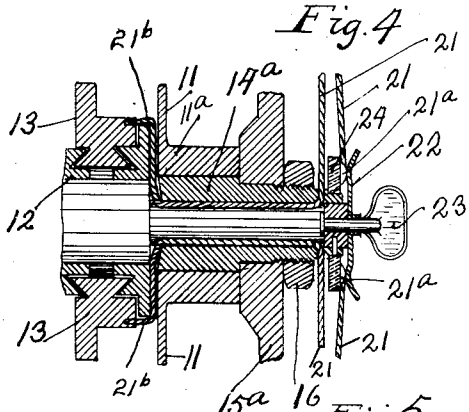


Fig. 5

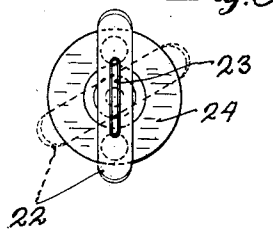


Fig. 6

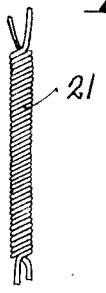
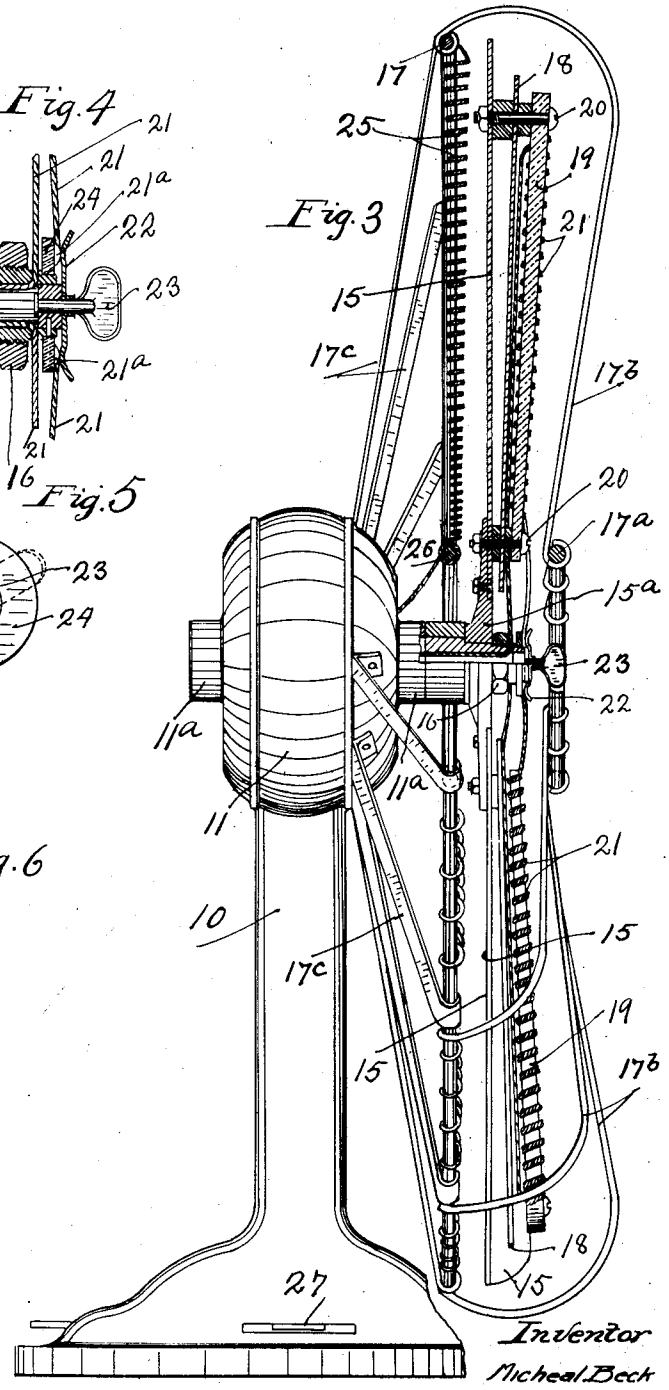


Fig. 3



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COMBINED ELECTRIC FAN AND HEATER

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Fig. 9

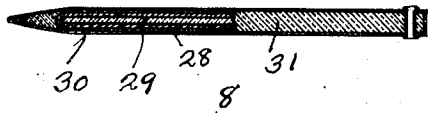


Fig. 7

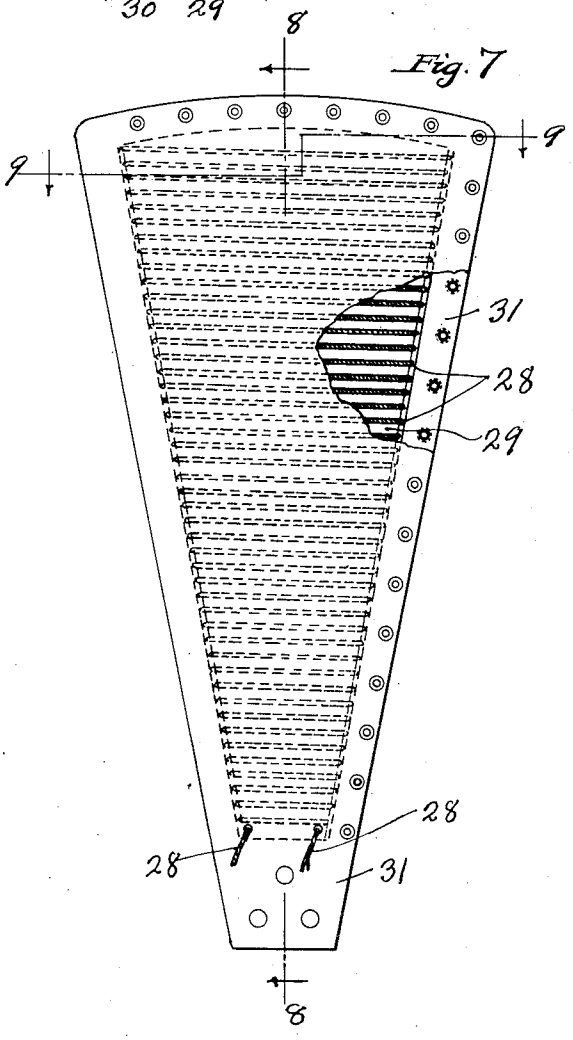
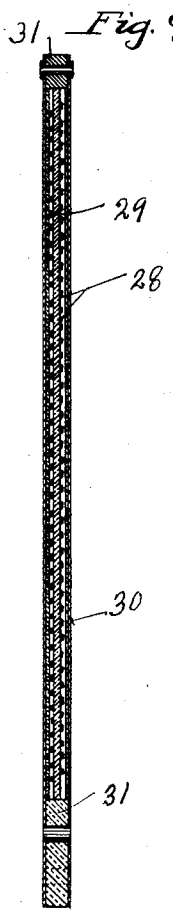


Fig. 8



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Patented Jan. 1, 1924. 1,479,494

UNITED STATES PATENT OFFICE.

MICHAEL BECK, OF MINNEAPOLIS, MINNESOTA.

COMBINED ELECTRIC FAN AND HEATER.

Application filed December 10, 1920. Serial No. 429,770.

To all whom it may concern:

Be it known that I, MICHAEL BECK, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Combined Electric Fans and Heaters; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention provides a highly efficient combined electrical fan and heater, in which certain of the electrical heating elements are carried by the fan blades. Generally stated, the invention consists of the novel devices and combinations of devices hereinafter described and defined in the claims.

Electrical heaters now generally in use employ stationary reflectors in connection with a heating coil and the projection of the heat rays is produced chiefly by reflection, but, in part, by direct radiation. The efficiency of the heater will depend largely on the amount of air per unit of time passed over or in contact with the heating coil or element.

In accordance with my invention, I obtain extremely high efficiency by combining heat reflectors and heating coils with the blades of a motor-driven fan. In this way, the heating elements carried by the fan are constantly swept through the air and, moreover, there is a constant reflection of the heat rays from the blades by means of the reflectors carried by or with the blades. For extremely high efficiency, a stationary electrical heater is also closely associated with the fan.

The invention is illustrated in the accompanying drawings, wherein like characters indicate like parts throughout the several views.

Referring to the drawings:

Fig. 1 is a front elevation of the combined fan and heater, some parts being removed and some parts being broken away;

Fig. 2 is an end elevation of one of the fan blades, one of the heat reflectors and one of the heating elements, which parts are connected as a single element;

Fig. 3 shows the combined fan and heater partly in side elevation and partly in vertical axial section;

Fig. 4 is a fragmentary detail view in section taken axially through the armature shaft;

Fig. 5 is a front elevation of the electrical switch shown in Fig. 4 and certain other views;

Fig. 6 is a fragmentary view of a coil of one of the heating elements;

Fig. 7 is a front elevation showing a heating element for application to a fan blade but which is of a somewhat different type than that shown in Figs. 1 and 3;

Fig. 8 is a section on the line 8—8 of Fig. 7; and

Fig. 9 is a section on the line 9—9 of Fig. 7.

A suitable standard or pedestal 10 supports the outer casing 11 of a small electric motor and the tubular armature shaft 12 which carries the customary or any suitable form of commutator 13, (see Fig. 4). The tubular armature shaft 12 has a reduced tubular front end section 14^a journaled in one of the axial sleeves 11^a of the motor casing 11.

The fan may have any desired number of blades, but, as shown, it comprises two diametrically opposite blades 15 connected by a common hub plate 15^a, which, by a nut 16, is rigidly clamped against a shoulder on the reduced end 14^a of the armature shaft. This fan is preferably arranged to work within a protecting cage, which, as shown, is made up of a large ring 17, a small ring 17^a, wires 17^b, that connect the rings 17 and 17^a, and supporting arms 17^c that directly support the large ring 17 from the motor casing 11 and thus indirectly support the entire cage. Each fan blade 15 is provided with a segmental heat-deflecting plate 18, preferably of copper, and also with a co-operating electrical heating element. This electrical heating element may take various other forms, but, as shown in Figs. 1 and 3, it comprises a segmental insulating core 19 and a surrounding coil or winding 21. The blade, reflector and core just noted are spaced apart by suitable spacing washers and are rigidly

connected together by nut-equipped bolts 20, (see particularly Fig. 3). By reference to Fig. 2, it will be noted that the fan blades 15 and preferably also the reflecting plates or reflectors 18, at their rear edges, are curved so that, under rotation of the fan, they produce a forward air-propelling action. Also, the reflecting plates and the cores 19 are set obliquely to the plane of rotation so that they co-operate in producing this air-propelling action.

In the preferred arrangement of the wires of the heating elements 21, an iron and a copper wire are twisted together in contact and connected in circuit as a single conductor. In such an arrangement, the copper wire will respond more quickly than the iron wire to the heating effect of the current and the iron wire acts as a supplemental or oscillatory conductor adapting the element to withstand quite high voltage and to carry a very large amount of current.

The inner terminals of the heating coils 21 are adapted to be connected, at will, by a switch bar 22 carried by a turn key 23, which, as shown, is swiveled to a plug in the end of the reduced end 14^a of the tubular armature shaft 12. As shown, these inner terminals of the two heating coils 21 are connected to diametrically opposite contacts 21^a carried by an insulating ring 24 that is secured to the extreme end 14^a of the armature shaft. The other terminals 21^b, of the two coils 21, are connected to diametrically opposite sections of the commutator 13, (see Fig. 4), being extended outward through the tubular section 14^a of the armature shaft and thence radially outward through diametrically opposite perforations therein. With this arrangement, the heat elements on the fan will be supplied with current from the motor through the commutator thereof.

The stationary electrical heater, as shown, is made up of a multiplicity of radially disposed coils 25 that are extended inward from the cage 17 and, at their inner ends, are anchored to a small inner ring 26. The several walls 25 are preferably connected in series and may be supplied with current from any suitable source and controlled by any suitable switch, but preferably by a switch that is operative independently of the switch that controls the supply of current to the heating elements on the fan. Such a switch, is indicated in part by the numeral 27, the same being applied in the base of the standard 10. In the arrangement above described, it is necessary that the rings 17 and 26 be of insulating material or covered with insulating material, so as to thereby prevent short circuiting of the coils 25.

The efficiency of the combined fan and heater is thought to be obvious. When both types of heating elements described, towit: those on the fan and those that are stationary, are supplied with current, an electrical heater of very high capacity is afforded. When less heat is required, it will be desirable, first, to cut out the stationary heater and to use the heater carried by the fan. When it is desired to use the fan without any heating action, both of the heating elements may be cut out of action. As is evident, the fan will draw air rapidly through the fixed heating coils 25, thereby bringing a large amount of air rapidly in contact with said coils. The coils or heating elements on the fan will be swept through the air at high velocity and the air will be projected from the fan blades at high speed, thereby heating a very large amount of air within any unit of time.

In Fig. 1, only a small number of radial coils are shown. The positions of other coils are indicated by broken lines marked 25^c.

Figs. 7, 8 and 9 show a modified form of heating element for application to the fan blades. In this construction, the heating coil 28 is wound around a segmental insulating core 29 of mica or the like. This core and coil are enclosed in a flat thin sheet metal casing 30, which, as shown, is, at one radial edge and at its outer edge, secured to a spacing strip 31.

What I claim is:

1. The combination with a motor-driven fan, of a heat-reflecting and an electrical heating element applied to a blade thereof.

2. The combination with a fan having a plurality of blades, of electrical heating elements applied to the fan blades, and an axial switch for making and breaking the circuit between the heating elements of said blades.

3. The combination with a motor-driven fan, of heat reflectors secured to and spaced from the fan blades, and electrical heating elements secured to and spaced from said reflectors.

4. The combination with a motor-driven fan, of heat reflectors secured to and spaced from the fan blades, and electrical heating elements secured to and spaced from said reflectors, the rear edges of the fan blades and of said reflectors being laterally bent to produce an air-propelling action.

5. The combination with a motor-driven fan, of electrical heating elements carried by the rotary element of the fan, and independent circuit connections whereby said movable and stationary heating elements may be independently thrown into and out of action.

6. The combination with a motor-driven fan having radial segmental blades, of radial segmental electrical heating elements applied to said fan blades on the air delivery side thereof.

7. The combination with a motor-driven fan, of an electrical heating element applied to the rotary element of the fan and com-

prising a conductor made of two wires of different metal twisted together or closely associated and connected as a single conductor.

8. The combination with a motor-driven fan, one blade of which affords a casing, and an electrical heating element carried in the casing.

9. The structure defined in claim 8 in further combination with a stationary electrical heating element located immediately back of the fan.

In testimony whereof I affix my signature.

MICHAEL BECK.