

Dec. 19, 1939.

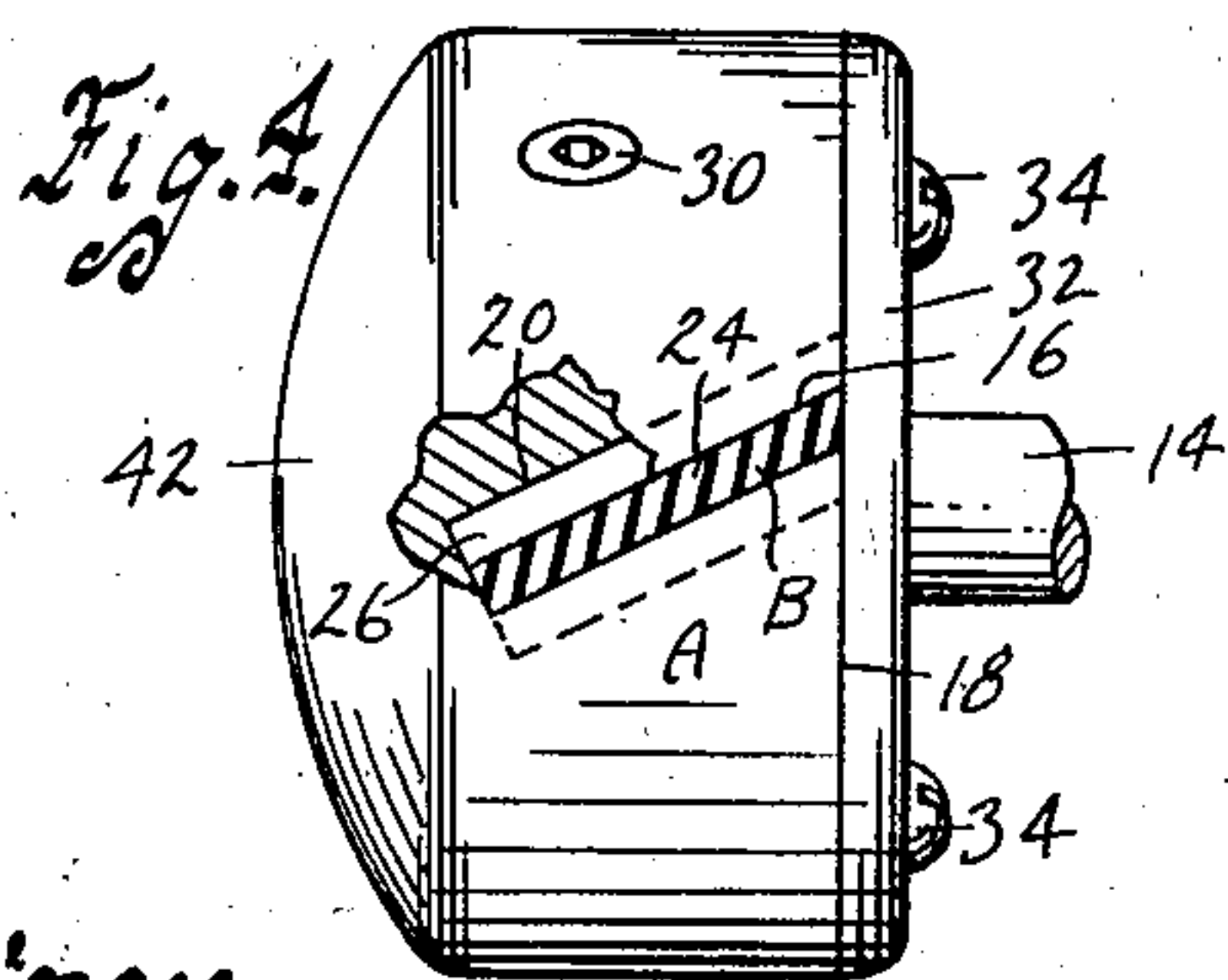
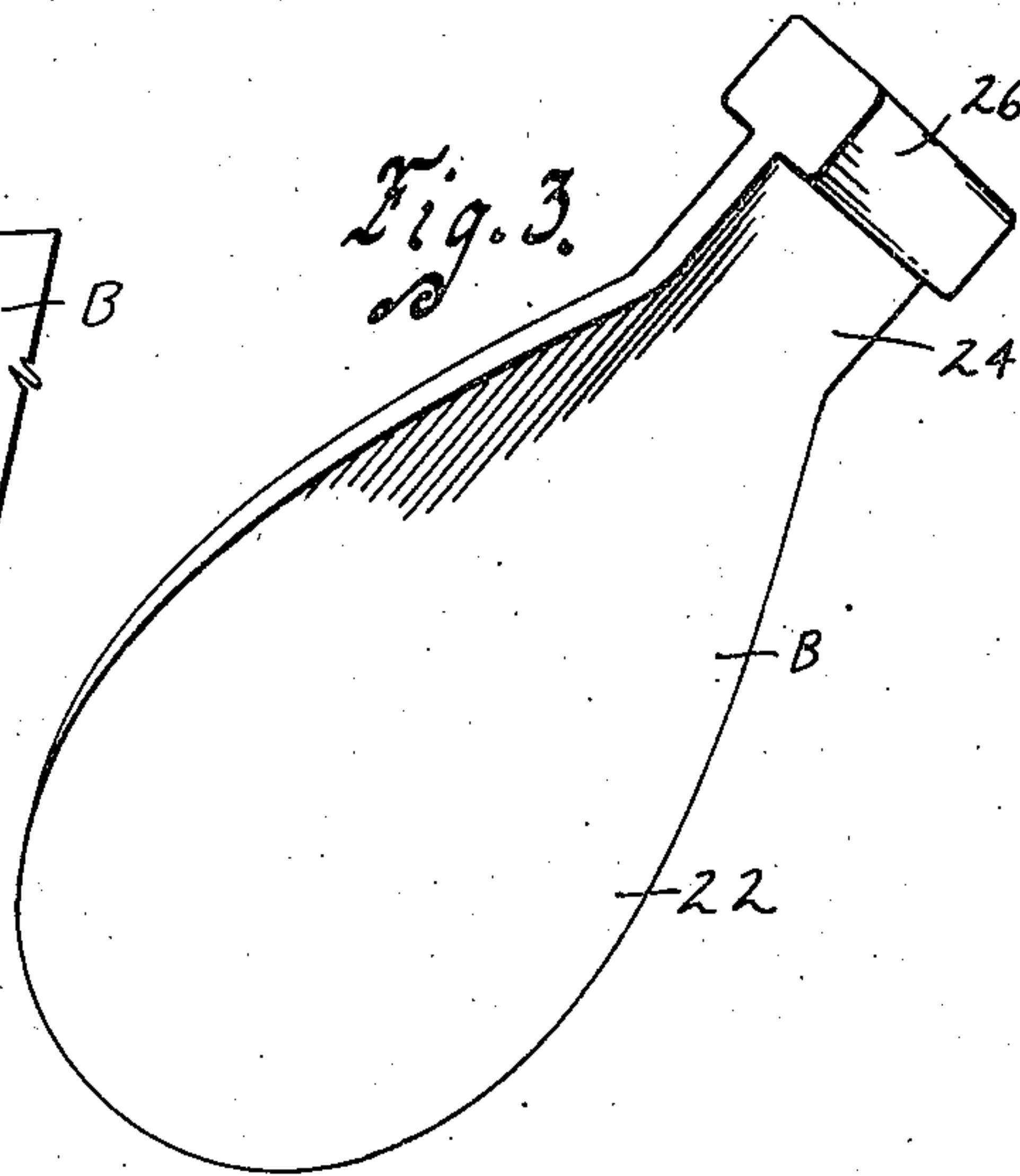
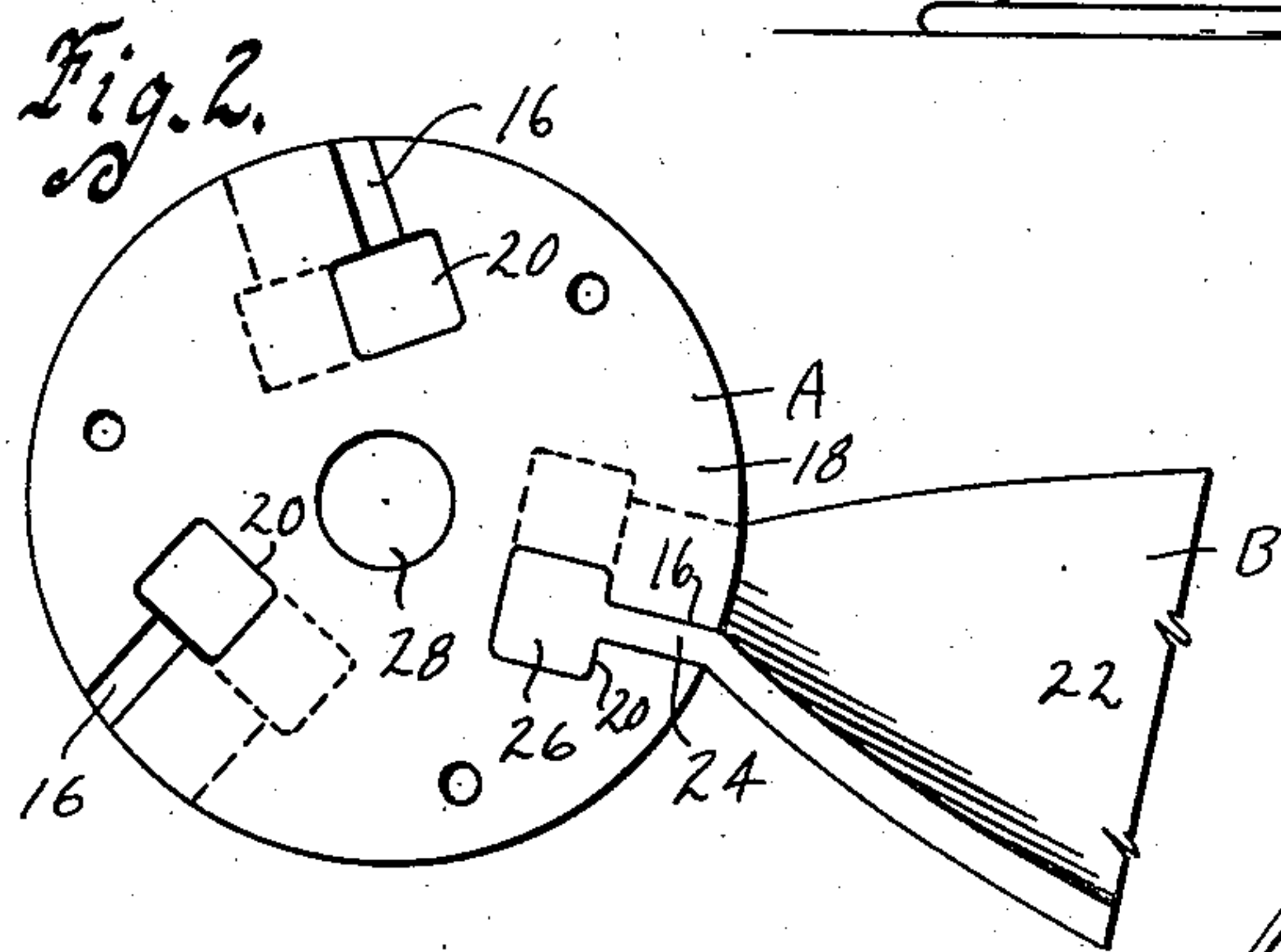
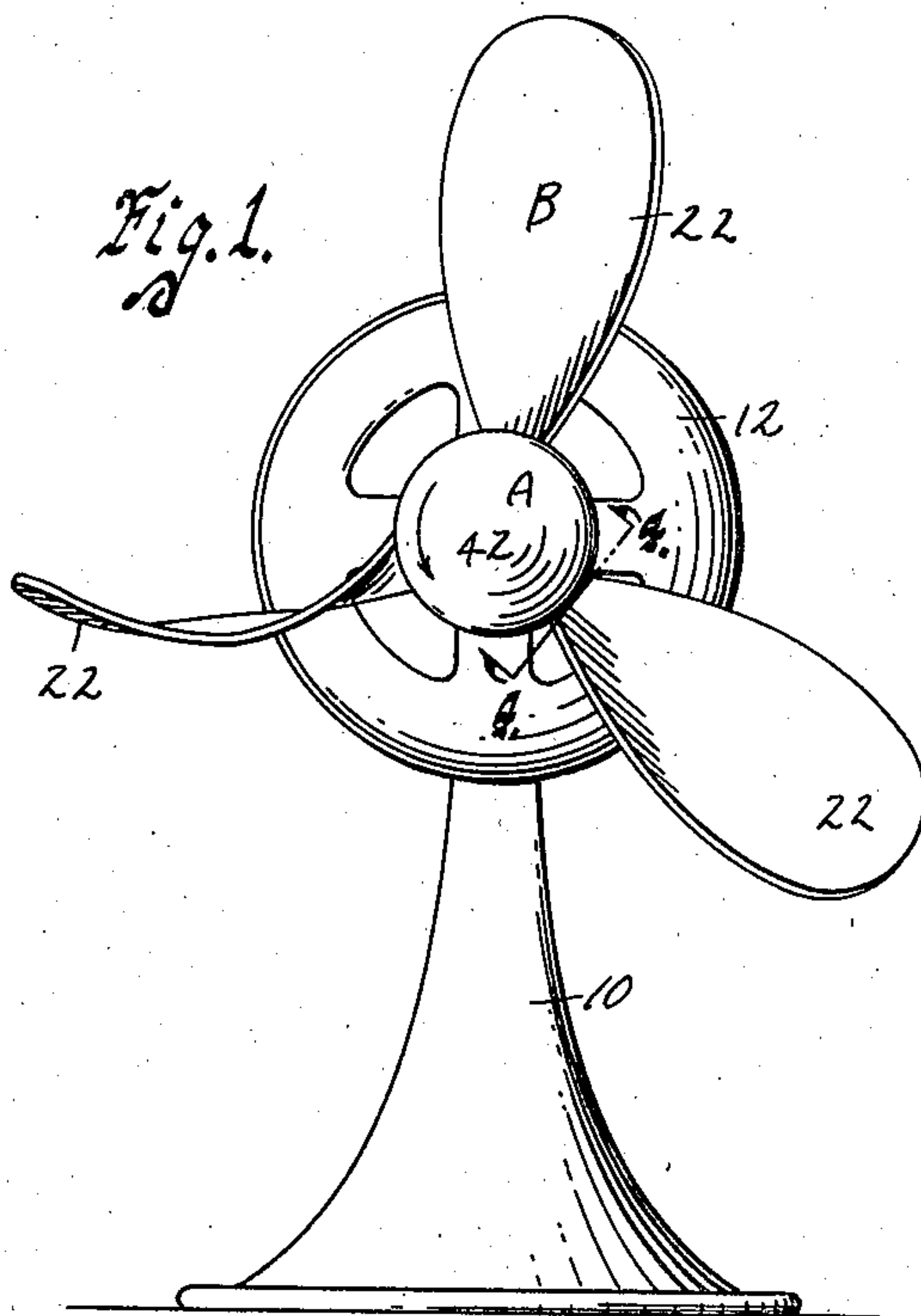
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2,183,891

FAN HUB AND BLADE STRUCTURE

Filed Dec. 16, 1935

2 Sheets-Sheet 1



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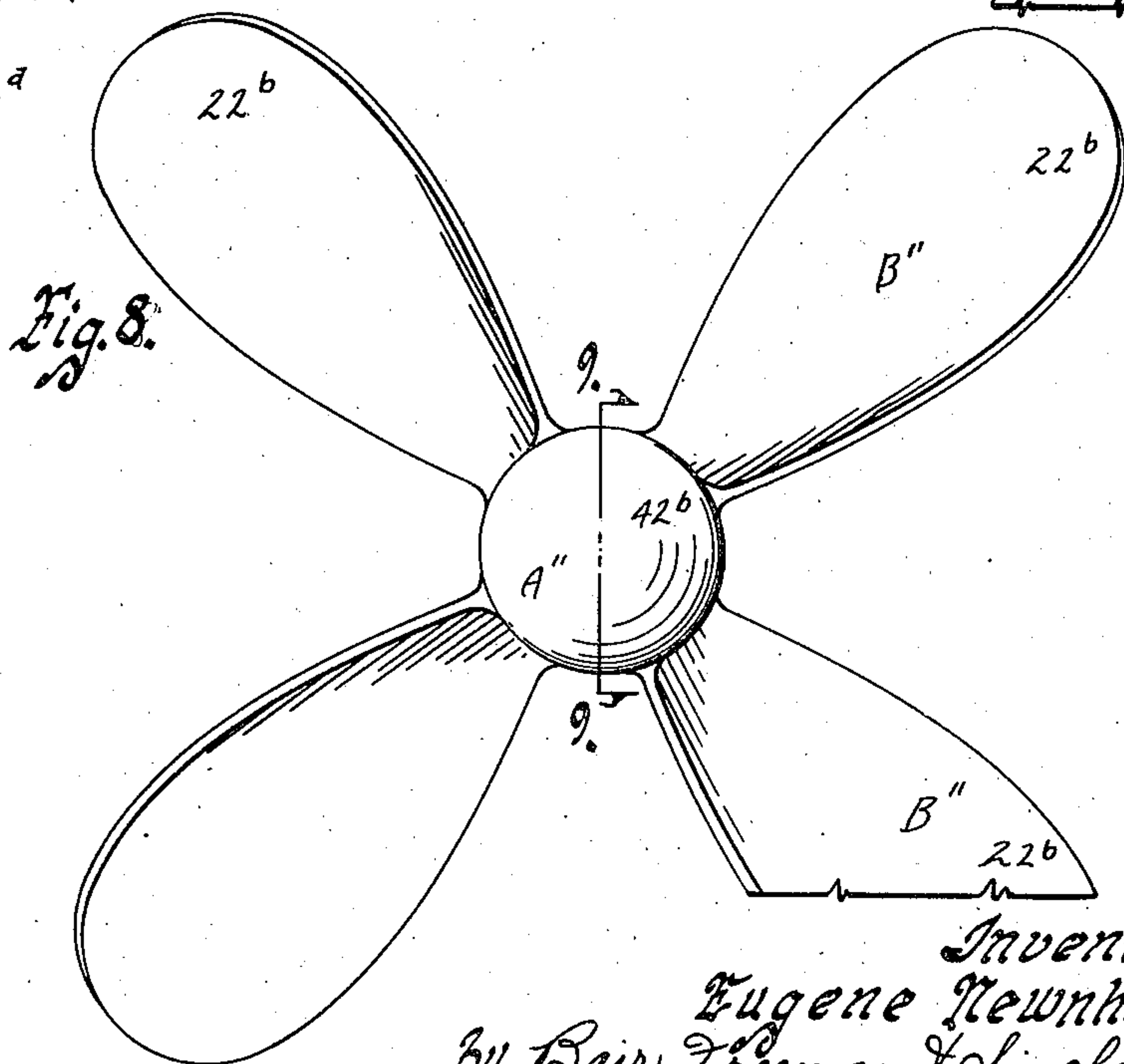
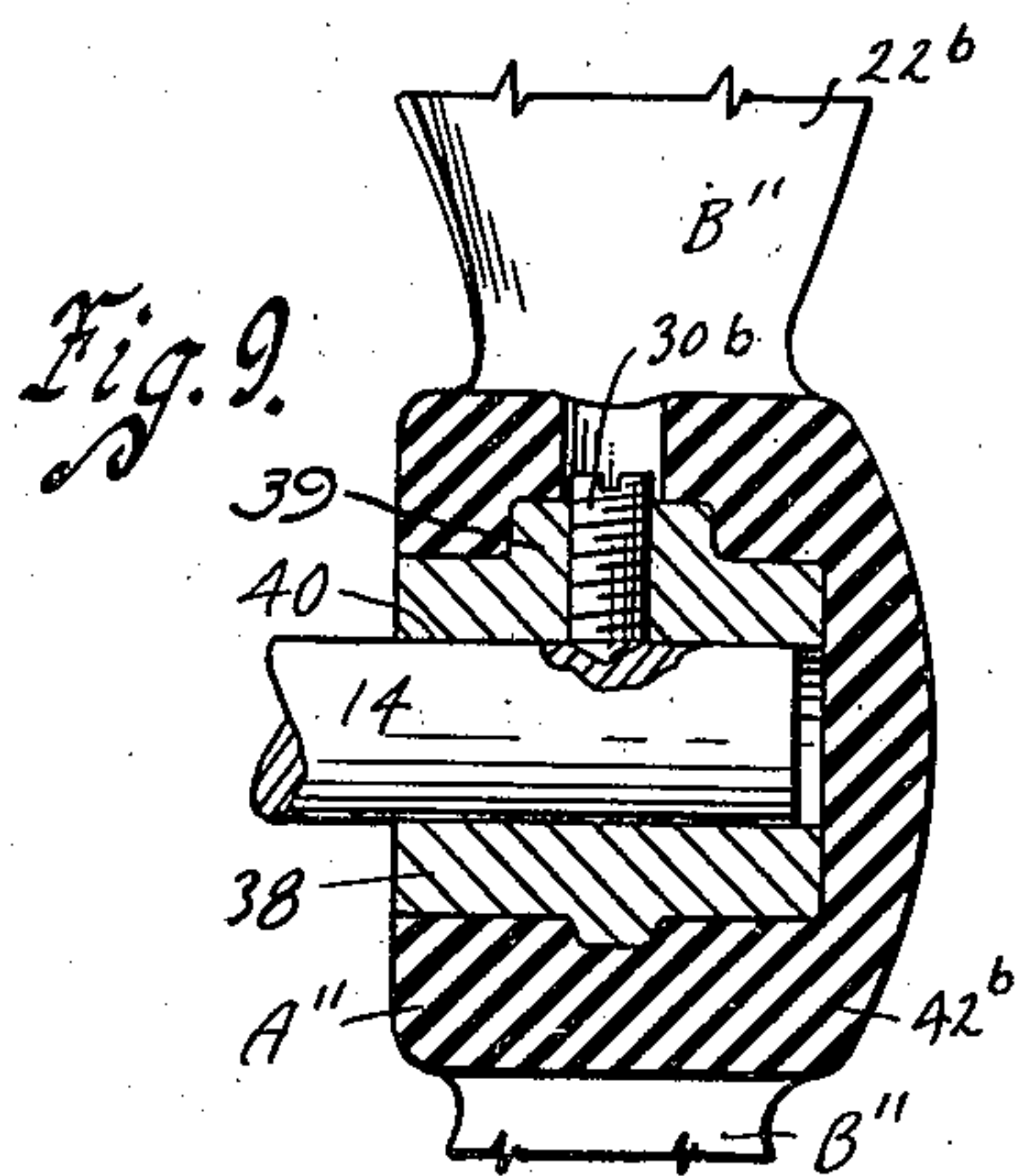
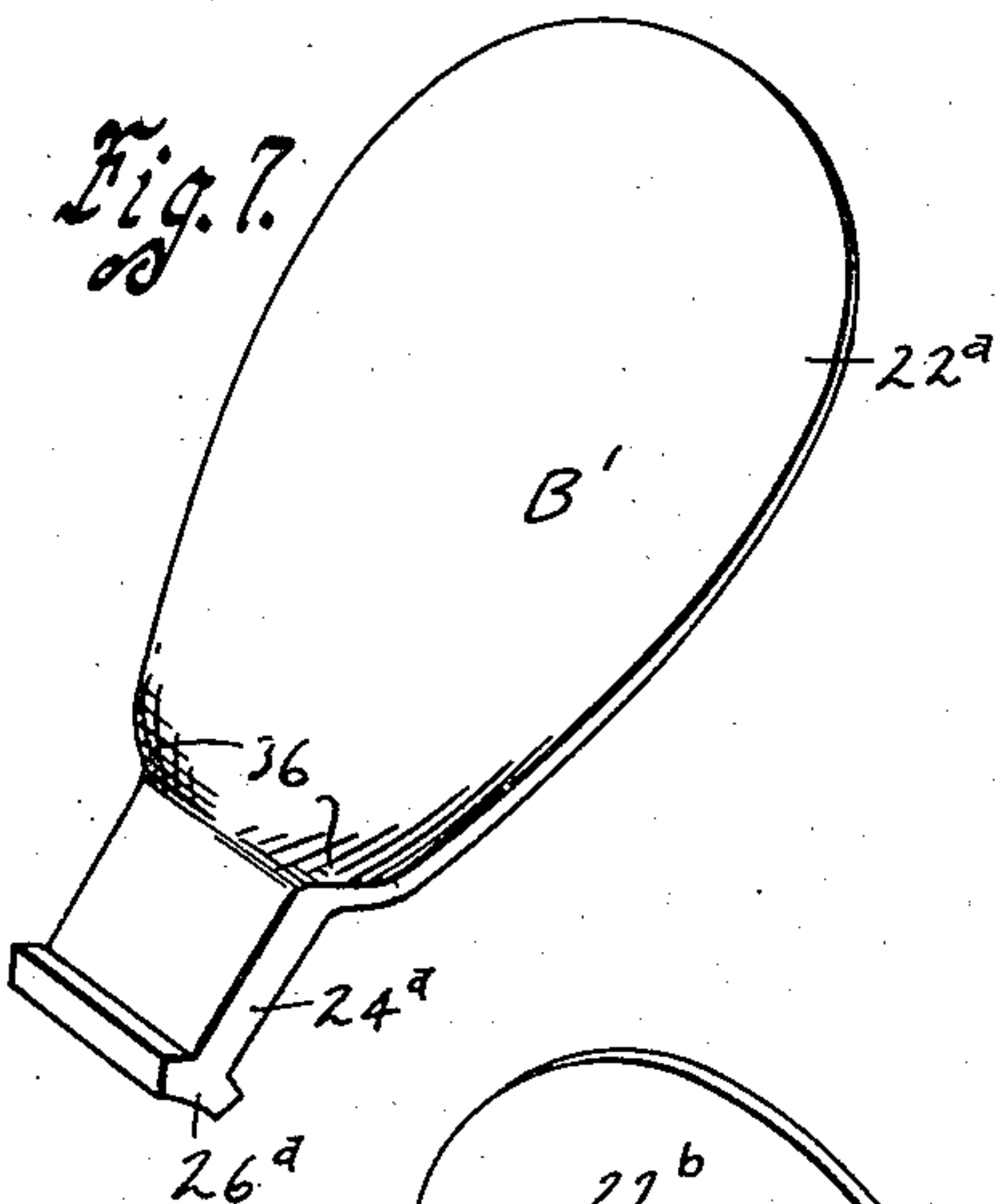
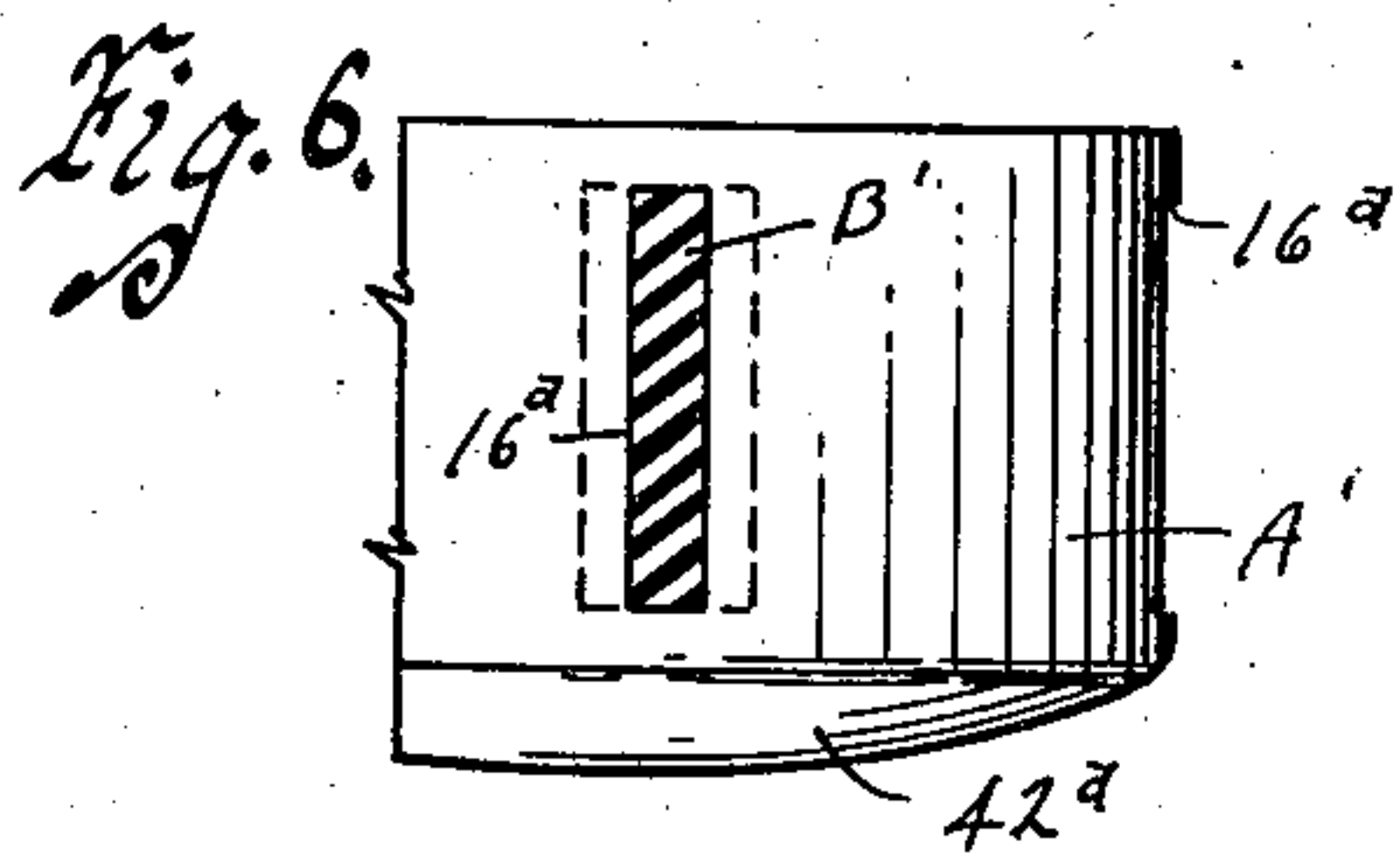
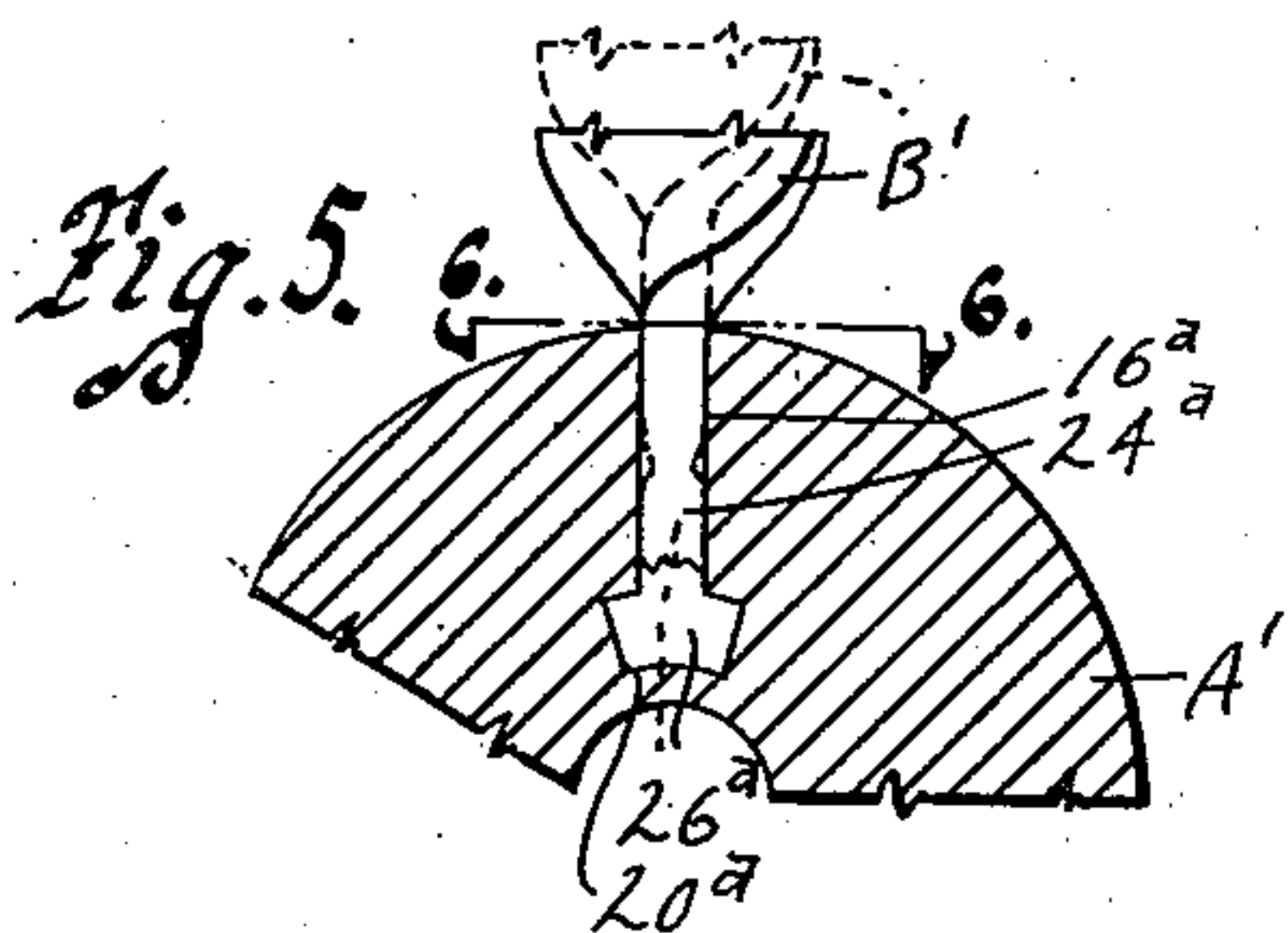
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FAN HUB AND BLADE STRUCTURE

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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FAN HUB AND BLADE STRUCTURE

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1 Claim. (Cl. 170—159)

The object of my invention is to provide a fan hub and blade structure which is simple, durable and comparatively inexpensive to manufacture.

A further object is to provide a fan structure including blades of rubber or similar semi-rigid and at least semi-flexible material, whereby a fan is provided which does not need a guard, since the blades upon striking a person's hand or other object can bend backwardly without injury to such object, the blades after clearing the object being again projected to their normal position due to the character of the material of which they are composed, and/or due to the action of centrifugal force.

A further object is to provide a fan structure in which the blades at least are formed of a material which is sufficiently flexible, upon being struck, to bend and of itself to resume its original position without permanent distortion, the blade, however, being sufficiently rigid that during rotation it will maintain its pitch angle for effectively propelling air.

A further object is to provide blades which are formed of rubber or the like, either with an integral hub having a drive shaft insert or individual blades set in a hub of metal or the like.

Another object is to provide means for retaining fan blades of rubber or the like in a hub, comprising enlargements on the blades received in enlarged portions of sockets in the hub, which sockets receive the blades to retain them in assembled position.

A further object is to provide a fan comprising a hub and a plurality of fan blades radiating therefrom, the hub and blades being of similar material, such material being flexible, the hub being of such thickness, however, that it is form-maintaining during operation, and the blades being relatively thin so that, although they normally retain their proper position and pitch angle relative to the hub, they can strike an object and bend under the impact thereof without permanent distortion, the blades returning to their original position after passing the object.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of the device, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claim, and illustrated in the accompanying drawings, in which:

Figure 1 is a front elevation of a fan embodying my invention, showing one of the blades bent to a position as caused by striking an object.

Figure 2 is a rear elevation of the fan struc-

ture showing a cover plate, the shaft and two of the blades being removed.

Figure 3 is a perspective view of one of the blades.

Figure 4 is a sectional view on the line 4—4 of Figure 1.

Figure 5 is a vertical sectional view through a modified form of hub.

Figure 6 is a sectional view on the line 6—6 of Figure 5.

Figure 7 is a perspective view of the blade shown in Figure 5.

Figure 8 is a front elevation of still another modified construction of hub and blade; and

Figure 9 is a sectional view on the line 9—9 of Figure 8.

On the accompanying drawings I have used the reference numeral 10 to indicate a fan base, and 12 a fan motor. My fan structure applied to the shaft 14 of the motor 12 comprises in general a hub A and a plurality of blades B. The hub A may be formed of metal or other relatively rigid material, and as shown in Figures 2 and 4 is provided with a plurality of sockets 16. These extend inwardly from the rear face 18 of the hub, and each is provided at its inner end with an enlargement 20.

The blades B comprise air propelling portions 22, shank portions 24 and enlarged head-like portions 26. The slot-like sockets 16, as shown in Figure 4, extend at the desired pitch angle of the blade relative to the axis of the shaft 14 and relative to the bore 28 provided therefor in the hub. Centrifugal force tends, upon rotation of the structure, to urge the blades radially outwardly relative to the hub, but the enlargements 20, extending in an other-than-radial direction, engage the head-like portions 26 to counteract such tendency. At 30 I illustrate a set screw for securing the hub to the shaft.

To retain the blades in position, I provide a cover plate 32 which may be suitably secured in position on the face 18 of the hub A by screws or the like 34.

The blades B are formed of some suitable flexible material such as rubber, whereby during rotation they will substantially maintain their pitch angle against the tendency of the air they propel to somewhat flatten the angle. The blades, however, upon striking an object will bend rearwardly as illustrated by the left blade in Figure 1, so as to not damage the object or the blade. Thus the fan can be used without a guard without danger of injuring a person's hand or the like when assuming a position within the arc of the blade tips.

Other material obviously having the desired characteristics can be used.

Besides the tendency of the rubber to maintain the pitch angle centrifugal force aids in such maintenance. Any twisting of the blade out of alinement with the socket 16 brings many points in the twisted portion to a position closer to the hub A, whereas centrifugal force tends constantly to urge all points as far as possible from the hub. It is, therefore, obvious that the blade material can be quite flexible without the undesired result of the pitch angle being flattened out to an undesirable degree. Obviously, the pitch angle can be increased to compensate for such tendency.

In the form of the invention shown in Figures 2 and 4, the blades are assembled relative to the hub by longitudinally sliding the blades into the sockets 16. The cover plate 32 then retains them in position.

Both ends of the sockets may be closed, as shown in Figures 5 and 6, in which similar parts bear the same reference numerals as the preceding figures with the addition of the distinguishing characteristic *a*, and the hub and blades are indicated as A' and B'. As shown by dotted lines in Figure 5, the heads 26a can be squeezed together and forced down through the sockets 16a, finally registering with the enlargements 20a and expanding into them. This construction eliminates providing a cover plate for the back end of the hub.

In Figures 5, 6 and 7 I also illustrate how the sockets 16a may extend axially of the hub, and the blades B' are then twisted as indicated at 36 adjacent the periphery of the hub to secure the desired pitch of the blades.

In Figures 8 and 9 I show blades B'' and a hub A'' which are all formed of rubber or like material moulded in one piece. The hub is provided with a metal insert 38 having a bore 40 to receive the motor shaft 14. The insert 38 has a boss 39 preventing relative rotation between the insert and fan hub.

In all forms of the invention it is preferable to provide closed ends 42, 42a and 42b to conceal the outer end of the motor shaft 14.

From the foregoing description it will be obvious that I have provided a fan structure having flexible fan blades of a material sufficiently stiff to retain the proper pitch for air delivery, and yet flexible or pliable enough to preclude hand or body injury when the fan is used without a guard. Any number of blades, of course, may project from the hub. Various means may be provided for mounting the hub on a rotor shaft of an electric motor or the like, thus providing a fan which does not need a guard, yet which is safe to use.

The blades can be fastened in any suitable manner, and many other changes and modifications besides those illustrated in the drawings can be made without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claim any modified forms of structure, or use of mechanical equivalents, which may be reasonably included within its scope.

I claim as my invention:

In a fan hub and blade structure, a hub having recesses in its periphery closed at their front ends and open at their rear ends to receive the ends of fan blades, fan blades of rubber or similar material having enlarged parts received in said recesses for retaining said blades assembled relative to said hub, said enlarged parts substantially filling said recesses from front to rear thereof, a shaft extending into the rear end of said hub and a cover plate therefor, said cover plate being perforated to receive said shaft and being positioned against said rear end of said hub whereby said cover plate engages said enlarged parts of said blades and retains the blades assembled in said hub and screws through said cover plate and into said hub to retain the cover plate assembled on the hub.

EUGENE NEWNHAM.