

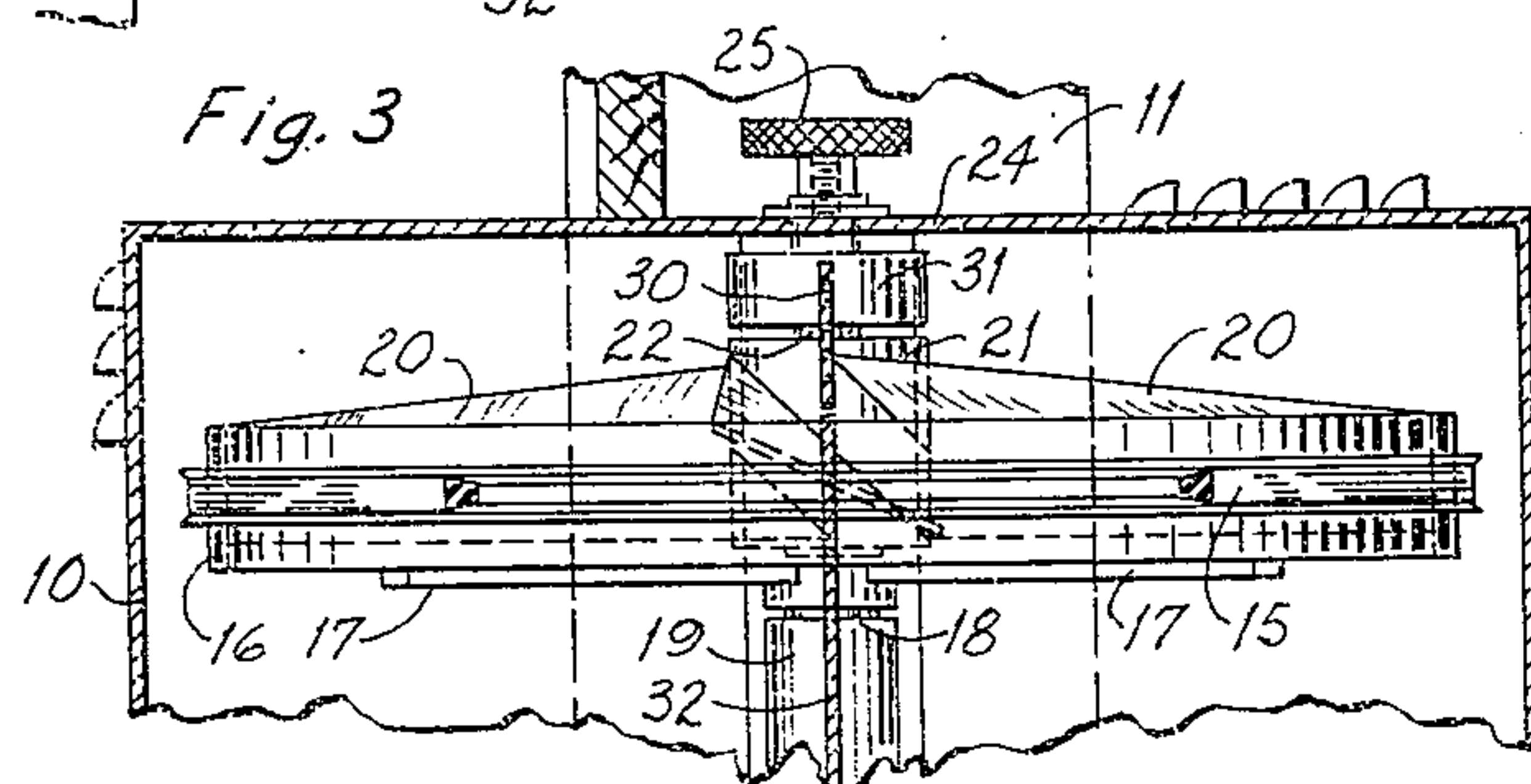
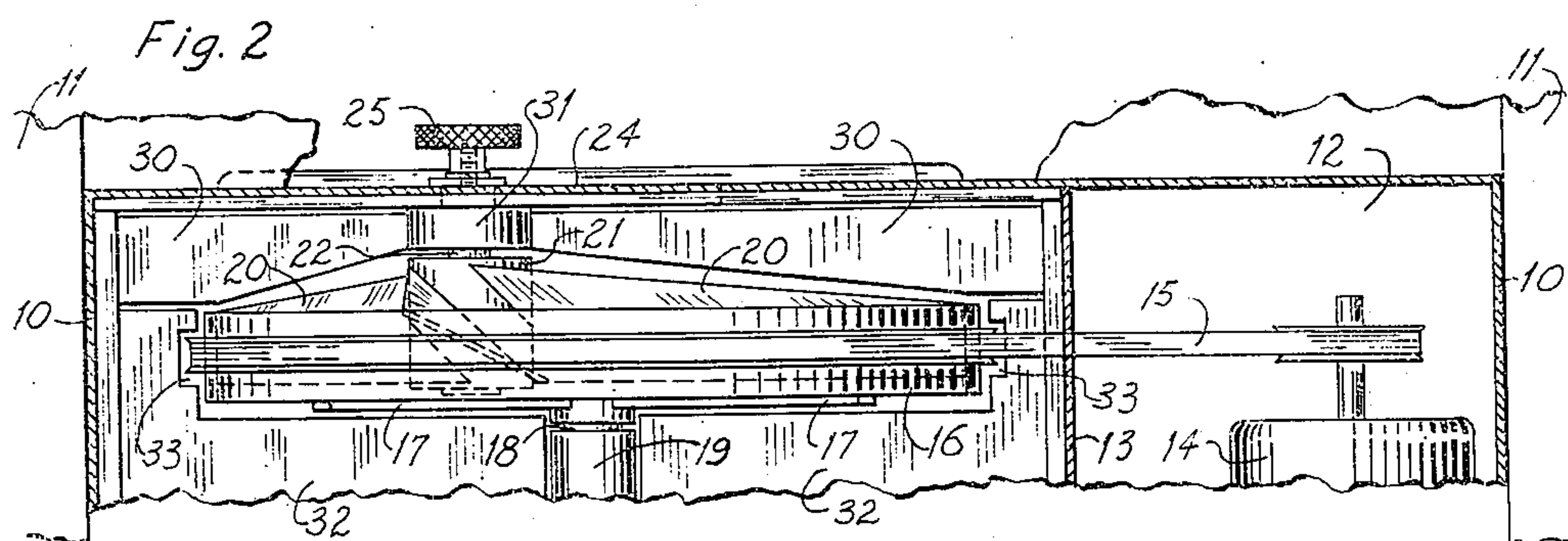
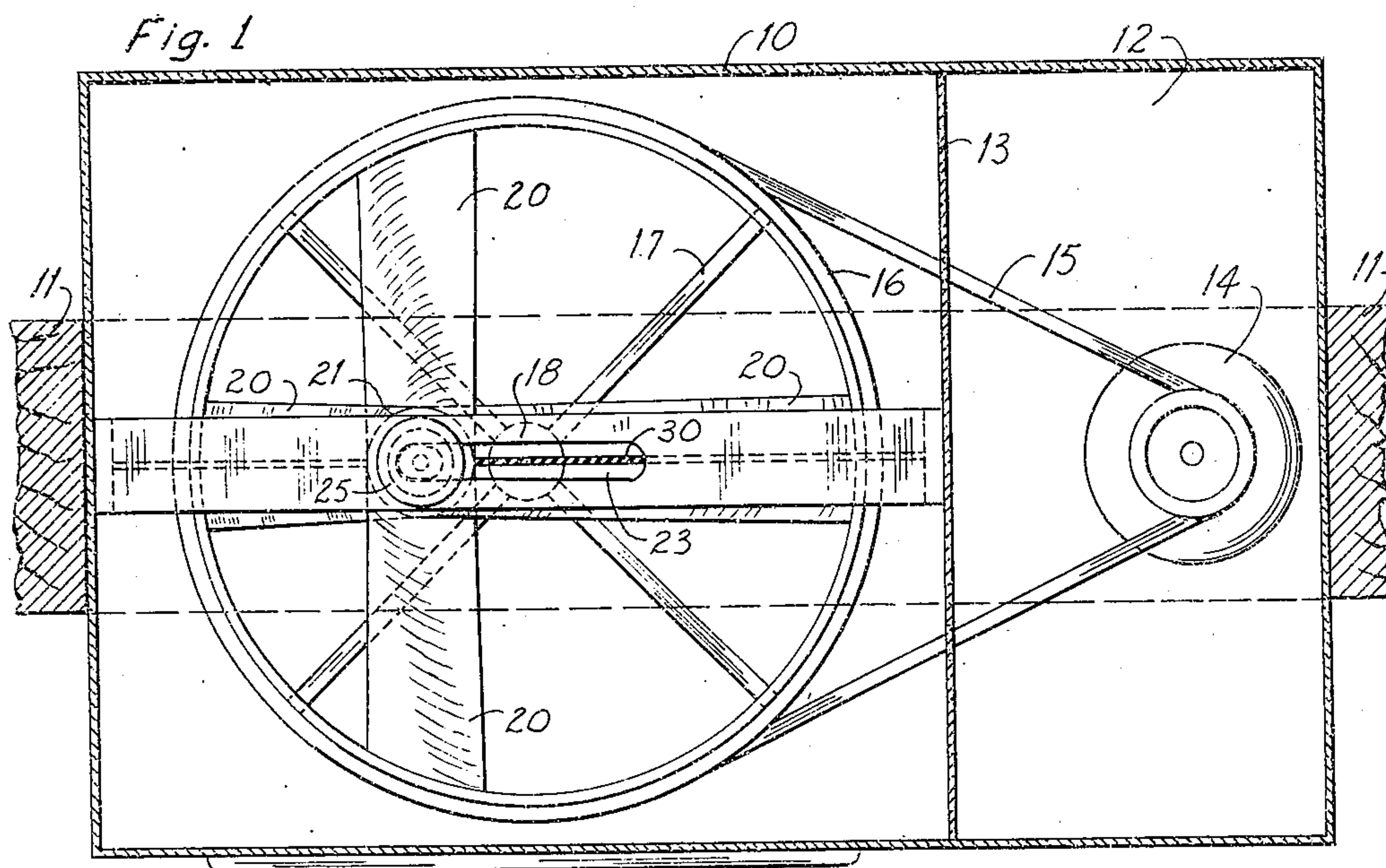
May 29, 1962

R. W. COCHRAN

3,036,444

METHODS OF AND APPARATUS FOR AIR CONDITIONING

Filed Jan. 26, 1959



Robert W. Cochran
INVENTOR.

BY *A. T. Sperry*
ATTORNEY

1

3,036,444

METHODS OF AND APPARATUS FOR AIR CONDITIONING

Robert W. Cochran, 1529 River Lane, Tampa 3, Fla.

Filed Jan. 26, 1959, Ser. No. 789,132

12 Claims. (Cl. 62-467)

This invention utilizes the conversion of kinetic energy into heat and to the cooling effect of the absorption of heat by the return of static energy to materials. More particularly, the invention is concerned with the Gough-Joule effect which relates to the heat generated by the stretching of an elastomer and to the absorption of heat by an elastomer as a stretched condition thereof relaxes. Heretofore, it has been suggested that this phenomena be utilized in efforts to modify the ambient temperature conditions of air by forcing such air over elastomers as they are stretched and/or relaxed. In the present invention, the elastomer material itself is formed in the manner of a rotary fluid impeller which may be elongated and relaxed as an incident to rotation. Thus, fluid brought into motion by the rotation of the impeller may receive heat from the impeller as it is stretched during one phase of impeller rotation, and while an isolated fluid may be cooled as the impeller is relaxed during the other phase of rotary movement of the impeller. An important feature of the invention is the condensation of moisture on the impeller during the cooling phase and the transfer of such moisture by the impeller to an isolated fluid in contact with the impeller during the heating phase.

It is, therefore, a primary object of the present invention to provide a method and apparatus in which the Gough-Joules effect is utilized through the use of impeller blades of elastomer material for air conditioning. Numerous other objects, features and advantages of the present invention will be apparent from a consideration of the following specification taken in conjunction with the accompanying drawings.

In the present invention, a housing is provided, suitably baffled, to permit the isolated passage of one source of air over elastomer impeller blades as they are stretched, while a separate chamber is provided through which a separate body of air may pass as the elastomer blades are relaxed. The blades of the impeller of the present invention are thin, flat elements of elastomer material radiating from a point which may be varied eccentrically with respect to the axis of rotation of an encircling carrier rim, whereby, upon rotation of the carrier, the blades of the elastomer may be cyclically stretched and relaxed. The blades are, of course, tilted in an angular plane so that in their rotation with the carrier, they will induce air flow. Due to the baffling of the impeller housing, an isolated body of the air passing over the blades as they are receiving tension will have imparted thereto the heat of such applied tension while a separate body of air passing over the blades as they are relaxed will deliver to the blades such heat as is absorbed by the relaxing of the elastomer material. Further, condensed moisture on the blades may be carried from the cooling zone to be delivered up to the air of the heating zone.

In the drawings;

FIGURE 1 is a plan view of one form of the present invention,

FIGURE 2 is a side elevation of that form of the invention shown in FIGURE 1,

FIGURE 3 is an end view of the device of FIGURES 1 and 2.

Referring more particularly to FIGURES 1, 2 and 3 of the present drawings, the numeral 10 indicates a generally rectangular housing disposed in an opening between the wall portions 11 of a building. At one end of the

2

housing 10, a compartment 12 is formed by a perforate baffle 13. Within the compartment 12, a conventional electric motor 14 is disposed for imparting motion to a drive belt 15, which extends through the apertures of baffle 13, to drive a circular carrier rim 16. The rim 16 is supported by radiating webs 17 extending from a fixed central axle 18 mounted within a suitably supported bearing sleeve 19.

Fixed to the inner face of the periphery of the carrier rim 16, there is provided a plurality of generally flat, angularly disposed elastomer impeller blades 20. The impeller blades 20 extend inwardly from the internal peripheral face of the rim 16 to an adjustable central rotary hub 21, carried by a shaft 22. Shaft 22 is slidably arranged within a slot 23 through the outer wall 24 of the housing 10. The position of the shaft 22 in the housing slot is adjustably secured by a knurled nut 25. This arrangement is such that the shaft may be selectively positioned at a point of desired eccentricity with respect to the shaft 18 whereby, as the carrier rim 16 is rotated, the blades 20 will be cyclically stretched and relaxed as they rotate with the rim 16. It is to be noted that the slot 23 extends an equal distance on either side of the axis of the rim axle 18. Thus, by loosening the knurled nut 25, the location of the shaft 22 may be adjusted. Such adjustment may be to locate the shaft 22 in line with the axis of the rim axle 18 without any eccentricity, in which position the blades act merely as impellers without any stretching or relaxing and hence, without any heat exchange to or from the air. When the shaft is shifted to eccentricity with respect to the axle 18, stretching and relaxing will occur to a degree determined by the degree of eccentricity. Since the amount of distortion of the blades determines the amount of heat discharged from or absorbed by the blades, the adjustment of the shaft 22 may determine the degree of heating or cooling effected by the rotation of the rim for any given speed. Therefore, the invention contemplates the use of thermostatic means for automatically adjusting the shaft in response to ambient conditions to maintain uniformity of such conditions. As will be noted from the following discussion of the baffling, a shift of the shaft 22 from one side of the axle 18 to the other will convert the operation from air cooling in one phase of impeller rotation to air heating in that phase and vice versa. Thus, the device may be utilized as a heat pump or an air cooler by a simple adjustment of the shaft 22.

It will, of course, be understood that blades 20 may be of any desired elastomer which responds with the Gough-Joule effect to convert the kinetic energy of stretching into heat and to absorb the heat when such stretching is relaxed. While rubber is one such elastomer, it has been found that synthetic elastomers in the nature of nylon, neoprene and/or other plastic materials may be more preferable since the energy required for the stretching may be more effective in respect to heat generated and absorbed than that of natural rubber. The invention, of course, is not limited nor confined to any specific type of elastomer to be used.

As hereinbefore noted, as air is admitted to the zone of relaxation of the blades, its temperature will be reduced by absorption of heat by the blades and moisture may then condense on the blades. Such moisture will pass with the blades to the stretching zone where it may be vaporized by the heat of stretching and thus delivered to the air of that zone. With the device baffled in the manner hereinafter to be described to isolate the zones, the operation may be one of cooling and dehumidifying and/or one of heating and humidifying.

In order to direct the flow of air induced by the rotation of the impeller blades 20 over the stretching blades

on one side and the relaxing blades on the other, a transverse elastomer baffle 30 is provided, extending across the housing 10 and intersecting the axis of the shaft 18. Since this perpendicular baffle 30 is of stretchable material and since its central portion is affixed to a non-rotary hub 31 mounted on the shaft 22, the adjustment of the eccentricity of the shaft 22 through movement in the slot 23, will be permitted without disturbing the baffle effect of the member 30. For cooperating with the baffle 30, there is provided a second companion baffle 32 which is cut away as at 33 to enclose the rim 16 and the impeller blades. The baffle 32 is here shown as co-planular with the baffle 30, providing for an axial separation in the housing 10 so that an isolated body of air may be induced to flow over the impeller blades as they are stretched in one-half of their revolution of rotation while at the other side of the baffle there will be a flow of a separate body of air by movement of the impeller in the other half of their cycle while they are relaxing. While the baffles 30 and 32 are here shown, by way of convenience, as in a common plane, it is contemplated that they may be angularly related by rotary movement with respect to each other to compensate for a possible loss of air between the isolated zones due to the inclination of the blades. If the degree of angular displacement of the baffles equals the projected width of the angled blades, air slippage between zones will be minimized. As indicated at 33, the housing is suitably louvered to permit efficient ingress and egress of air. Equivalent screens or perforations may be utilized, so constructed and arranged as to prevent admission of dirt, dust, moisture or foreign matter.

From the foregoing it will be seen that the present invention provides a novel, simple, efficient and effective air conditioning device and method for both heat exchange and exchange of humidity. It will, of course, be understood that the invention is not limited nor confined to the specific structural details herein illustrated and that in the practice of the invention numerous changes, modifications and the full use of equivalents may be resorted to without departure from the spirit or scope of the invention as outlined in the appended claims.

What I claim is:

1. An air conditioner operable on the principle of the Gough-Joule effect including a plurality of air propeller blades, extending radially from a common axis formed of elastomer material, each blade defining an air impeller surface tilted with respect to said axis for moving air in the direction of said axis, means for rotating said blades about said axis and means for stretching and relaxing said blade as an incident to their rotation, said last mentioned means including the mounting of the other ends of said blades eccentrically of said axis of rotation.

2. The device as set forth in claim 1 in which means are provided for isolating air in contact with the blade while stretching from air in contact with the blade while it is relaxing.

3. In a device of the character set forth, a housing, a rotary air radial blade fan for directing air in the direction of the axis of rotation of said fan in said housing including blades formed of elastomer material, means for rotating said impeller, means for stretching and relaxing said blades as an incident to their rotation and baffle means dividing said housing into separate chambers through which said impeller blades pass.

4. In a device of the character set forth, a housing, a rotary air radial blade fan for directing air in the direction of the axis of rotation of said fan in said housing including blades formed of elastomer material, means for rotating said impeller, means for stretching and relaxing said blades as an incident to their rotation and baffle means dividing said housing into separate chambers through which said impeller blades pass, said baffle means being so constructed and arranged as to isolate the air in contact with the blades while being stretched

from the air in contact with the blades while they are relaxing.

5. In a device of the character set forth, a housing, a rotary air radial blade fan for directing air in the direction of the axis of rotation of said fan in said housing including blades formed of elastomer material, means for rotating said impeller, means for stretching and relaxing said blades as an incident to their rotation, said means including a central mounting for the blade eccentrically disposed with respect to the axis of rotation of said impeller, and baffle means dividing said housing into separate chambers through which said impeller blades pass.

6. In a device of the character set forth, a housing, a rotary air radial blade fan for directing air in the direction of the axis of rotation of said fan in said housing including blades formed of elastomer material, means for rotating said impeller, means for stretching and relaxing said blades as an incident to their rotation, said means including a central mounting for the blade eccentrically disposed with respect to the axis of rotation of said impeller, and baffle means dividing said housing into separate chambers through which said impeller blades pass, and means for varying the eccentricity of said central mounting.

7. In a device of the character set forth, a housing, a rotary air radial blade fan for directing air in the direction of the axis of rotation of said fan in said housing including blades formed of elastomer material, means for rotating said impeller, means for stretching and relaxing said blades as an incident to their rotation, said means including a central mounting for the blade eccentrically disposed with respect to the axis of rotation of said impeller, means for varying the eccentricity of said central mounting, and baffle means dividing said housing into separate chambers through which said impeller blades pass, said baffle means being so constructed and arranged as to isolate the air in contact with the blades while being stretched from the air in contact with the blades while they are relaxing.

8. An air conditioner including a housing, a rotary air radial blade fan for directing air in the direction of the axis of rotation of said fan in said housing having elastomer blades, means for rotating said impeller on a central axis, a variable mounting for the inner ends of said elastomer blades whereby they may be eccentrically secured with respect to said central axis and a pair of baffles dividing said housing in a plane including the axis of rotation of said impeller.

9. An air conditioner including a housing, a rotary air radial blade fan for directing air in the direction of the axis of rotation of said fan in said housing having elastomer blades, means for rotating said impeller on a central axis, a variable mounting for the inner ends of said elastomer blades whereby they may be eccentrically secured with respect to said central axis and a pair of baffles dividing said housing in a plane including the axis of rotation of said impeller, and in the plane of the variable mounting of the inner ends of the blade.

10. An air conditioner including a housing, a rotary air impeller in said housing having elastomer blades, means for rotating said impeller on a central axis, a variable mounting for the inner ends of said elastomer blades whereby they may be eccentrically secured with respect to said central axis and a pair of baffles dividing said housing in a plane including the axis of rotation of said impeller, and in the plane of the variable mounting of the inner ends of the blade, one of said baffles being formed of flexible material and being secured to said variable mounting.

11. An air conditioner including a housing, a rotary air impeller in said housing having elastomer blades, means for rotating said impeller on a central axis, a variable mounting for the inner ends of said elastomer blades whereby they may be eccentrically secured with respect

5

to said central axis and a pair of baffles dividing said housing in a plane including the axis of rotation of said impeller, and in the plane of the variable mounting of the inner ends of the blade, one of said baffles being formed of flexible material and being secured to said variable mounting, said housing having louvers for the ingress and egress of air on both sides of said baffles.

12. An air conditoiner including a housing, a rotary air impeller in said housing having elastomer blades, means for rotating said impeller on a central axis, a variable mounting for the inner ends of said elastomer blades whereby they may be eccentrically secured with respect to said central axis and a pair of baffles dividing said housing in a plane including the axis of rotation of said impeller, and in the plane of the variable mounting of

6

the inner ends of the blade, one of said baffles being formed of flexible material and being secured to said variable mounting, said housing having louvers for the ingress and egress of air on both sides of said baffles and motor means for rotating said impeller.

References Cited in the file of this patent

UNITED STATES PATENTS

10	2,336,580	Yeatman	Dec. 18, 1943
	2,931,189	Sigworth	Apr. 5, 1960

OTHER REFERENCES

15	Institution of the Rubber Industry, volume 1, pages 162-167, June 25-April 26, 1934.
----	--