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3,480,209

HUMIDIFIER AND SYSTEM

Filed June 14, 1967

3 Sheets-Sheet 1

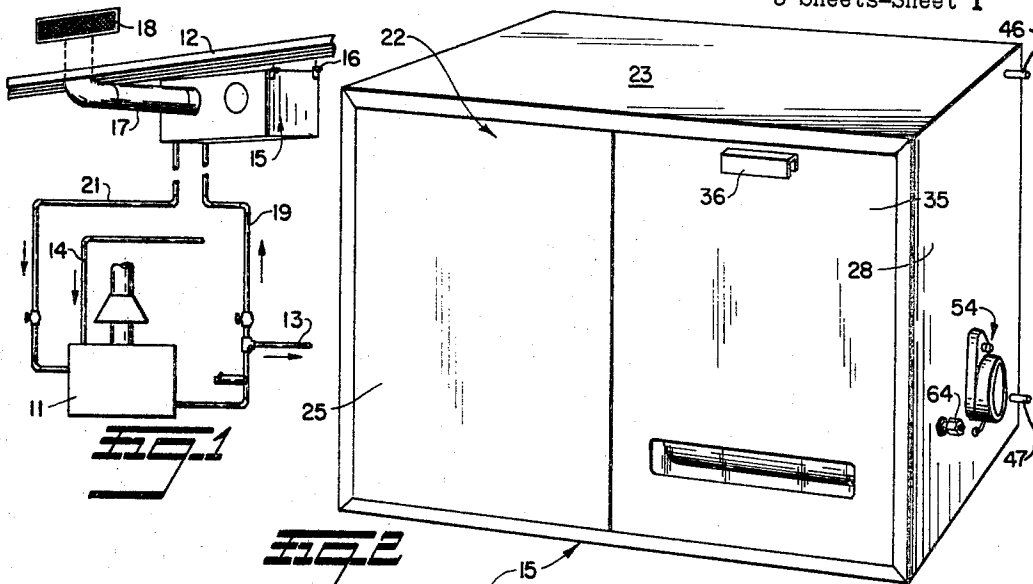
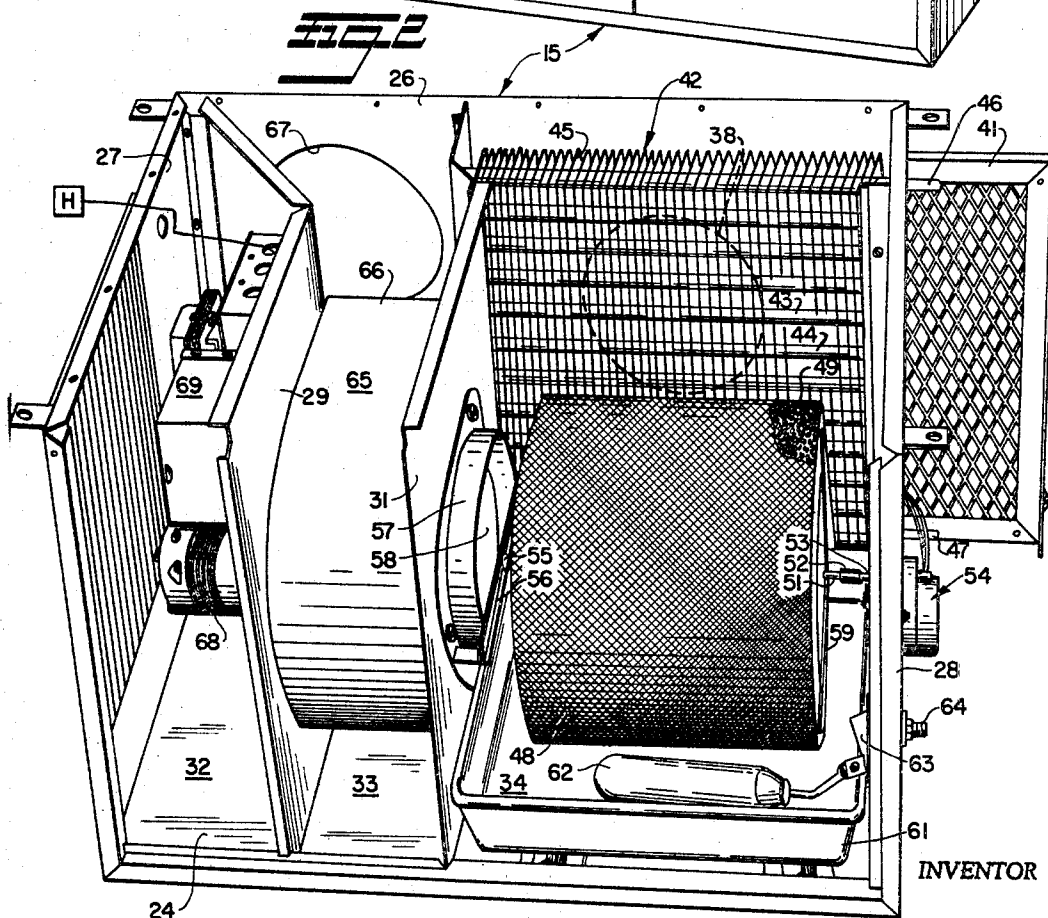


Fig. 3

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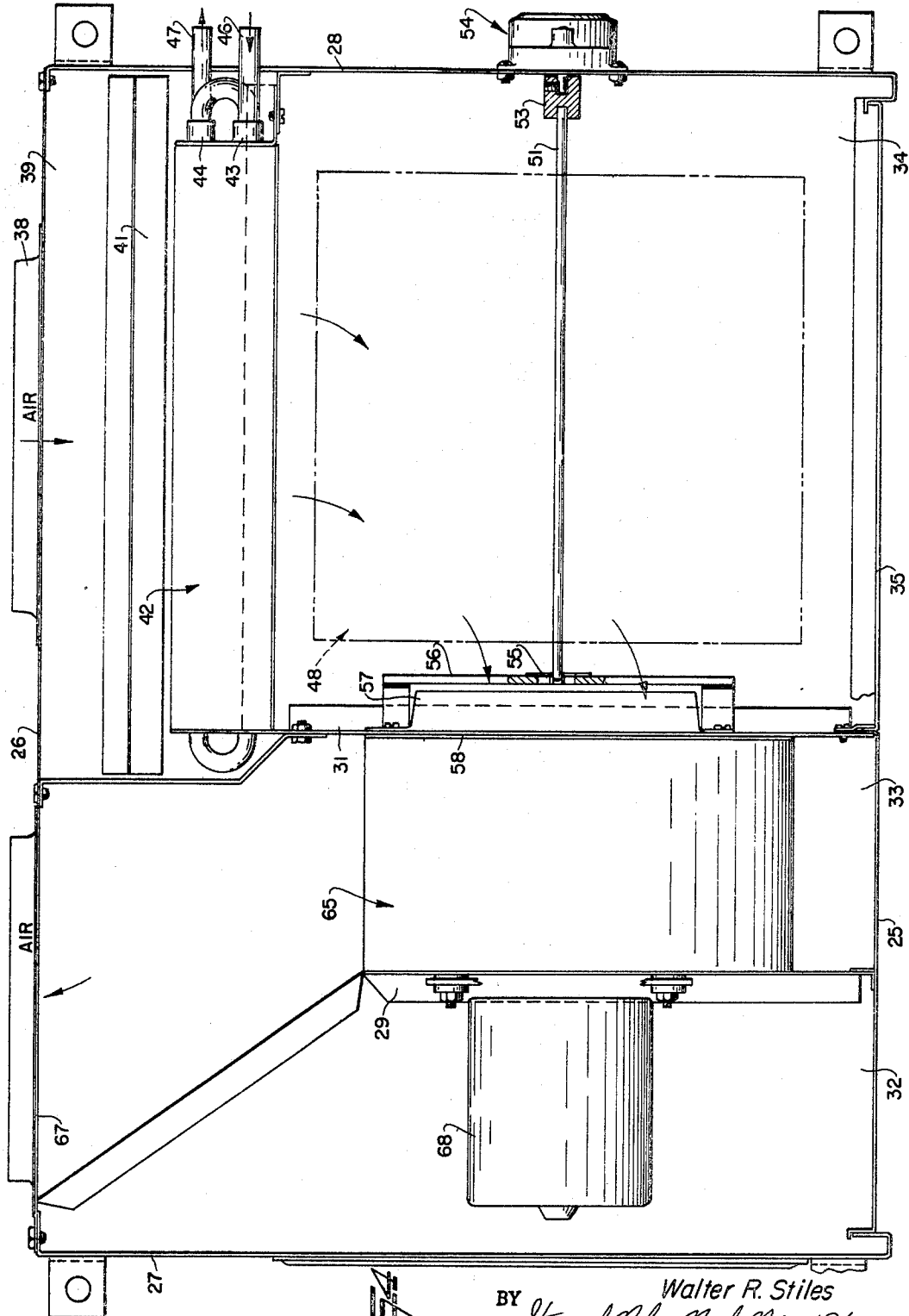
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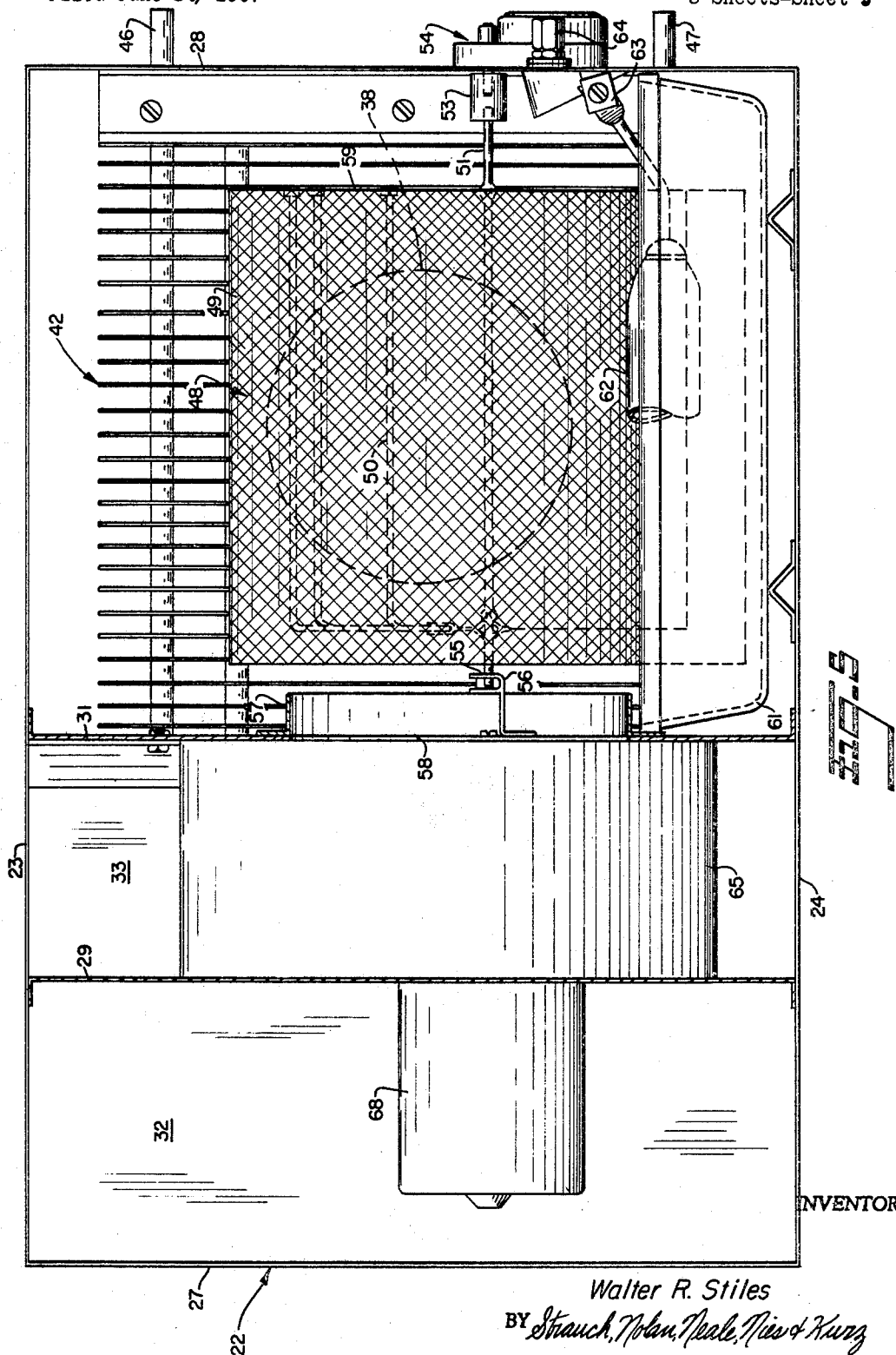
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HUMIDIFIER AND SYSTEM

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3 Sheets-Sheet 3



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1

3,480,209

HUMIDIFIER AND SYSTEM

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5 Claims

ABSTRACT OF THE DISCLOSURE

A humidifier system comprises a humidifier assembly which draws air successively through a dry filter, a heating unit and a humidifying unit before discharge into the space to be humidified. The humidifier assembly is adapted primarily for houses and the like that are heated by hot water or steam and the heating unit of the humidifier is connected to the source of hot water or steam which may be the space heating system boiler or the usual hot water tank. The heating unit may be electrical. The humidifier assembly is compact and contained in a casing readily installed to derive its air heating from the existing space heating system, but the humidifier system is otherwise independent. It supplies clean filtered dry heated moist air, usually above body temperature.

BACKGROUND AND SUMMARY OF INVENTION

The invention is intended primarily for houses that are space heated by hot water or steam or electricity. Houses that are heated by hot air usually have humidifiers built into the heating air ducts, but where steam or hot water radiators are present, or where the heating is by electrical panels or units, recourse is usually had to heating shallow bodies of water at the radiators or panels to evaporate the water into the room. These arrangements are not satisfactory because the water containers occupy space and sometimes leak, special controls and piping are needed, and automatic continuous humidity control is almost impossible because of the on-off nature of the space heating system and the inertia of the water bodies in heating to evaporation temperature.

The invention provides for the first time a humidifier system that is continuously effective for independent humidity control of building space, and it employs apparatus that is simple in structure, compact in arrangement and easy to install in conjunction with existing space heating systems; and this is the object of the invention.

BRIEF DESCRIPTION OF DRAWINGS

FIGURE 1 is a schematic view showing a system containing the humidifier of the invention;

FIGURE 2 is a generally perspective view showing a humidifier according to a preferred embodiment;

FIGURE 3 is a generally perspective top view of the humidifier with the top and one side wall removed to show internal construction;

FIGURE 4 is a top plan view with the top wall removed showing further the internal structure; and

FIGURE 5 is a side elevation with the side wall removed to further show the compartmenting arrangements.

PREFERRED EMBODIMENTS

FIGURE 1 shows a system wherein a hot water boiler 11 of a usual type is located in the basement of a building having a first floor 12. The usual hot water supply and return lines 13 and 14 respectively provide water for the space heating radiators (not shown) within the building.

A humidifier assembly 15 according to a preferred embodiment of the invention is attached to the ceiling just

2

below floor 12 as by hangers 16. A conduit 17, which as will appear carries moistened air, extends from the humidifier up through the floor into a register 18 in the first floor room wall. A hot water supply line connects main line 13 to the humidifier, and a return water line 21 extends from the humidifier to the boiler.

The humidifier unit comprises a generally rectangular sheet metal casing 22 having parallel top and bottom walls 23 and 24, parallel front and rear walls 25 and 26, and parallel end walls 27 and 28. Internally the casing is separated by the transverse walls 29 and 31 into a motor and control compartment 32, a blower compartment 33 and an air heating and humidifying compartment 34. The front wall panel 35 is removable by pulling on handle 36 for access to the compartment to clean or replace the humidifier drum as will appear.

FIGURE 4 shows the air admission opening at 38 in rear wall 26, and the air entering casing 22 passes into chamber 39 across which is mounted a relatively large area rectangular filter 41. Filter 41 may be of the usual dry glass wool type which may be slightly oiled and it serves to clean the entering air prior to humidification. Filter 41 is slidable in and out of the casing on suitable guideways that keep it vertical in the assembly.

A heat exchange unit 42 extends across chamber 39, and it comprises one or more vertical arrays indicated at 43 and 44 of horizontally extending tubing in series as illustrated with thin sheet metal fins 45 mounted on the tubing. Fins 45 extend parallel to the air flow path through the heat exchange unit. The tubing has an upper inlet conduit 46 connected to hot water supply line 19 and a lower outlet conduit 47 connected to return line 21. Thus hot water circulates through the heating unit 42, and the filtered air passing between the heated tubes and the sheet metal radiator fins is controllably heated before encountering the humidifier drum 48.

Drum 48 is preferably a one inch thick cylindrical sleeve or pad 49 of foamed open pore polyurethane carried by a cage 50 that is rotatably mounted by a horizontal shaft 51 within compartment 34. Preferably sleeve 49 is covered by a surrounding open mesh water impervious plastic support as indicated at 52. This sleeve and support are preferably the same as disclosed in Powers application Ser. No. 548,237 filed May 6, 1966 for "Rotary Humidifier Assemblies."

Shaft 51 has one end connected by coupling 52 to output shaft 53 of a small electric motor assembly 54 secured on the housing. The other end of shaft 51 is mounted in a bearing 55 in a strap 56 that extends across a cylindrical flange 57 surrounding an air outlet opening 58 in wall 31. The axis of shaft 51 is parallel to the planes of the filter 41 and heat exchange unit 42.

Drum 48 is coaxial with opening 58, and a plate 59 closes the side of drum 58 opposite opening 58. The lower sector of drum 48 is immersed in water in a pan 61 wherein the water is replenished and maintained at a suitable level by a float 62 controlling a valve 63 in water intake conduit 64.

Motor 54 rotates drum 48 at a slow constant speed, about one to four revolutions per minute.

Compartment 33 contains a blower unit 65 of a conventional type having an inlet through wall opening 58 and an outlet indicated at 66 from which air is discharged forcibly through rear wall opening 67 into conduit 17. The blower housing is preferably of the scroll type, and the fan therein (not shown) is continuously rotated at suitable speed by an electric motor 68 having controls generally indicated at 69 and not concerned with the present invention.

It will be understood that boiler 11 may be a steam boiler, and coils 43, 44 heated by steam. Also the

3

hot water lines 19 and 21 may be connected to the usual hot water heating tank instead of the space heater boiler. In some embodiments the air inlet 38 may be connected to draw in fresh air from outside the building, and the system of the invention may thus provide humidified fresh air under control even if heat exchange unit 42 should be disconnected from a source of hot fluid.

Also heat exchange unit 42 may be an electrical heater, particularly where the house is heated by electrical units and no hot fluid source is available.

During operation both motors 54 and 68 are energized. Motor 68 drives blower unit 65 whereby air is continuously drawn in through casing opening 38 and first passes through the dry filter 41 which removes from it dust and like particles and impurities. This clean dry air then passes through the heat exchange unit 42 wherein the clean air temperature is raised, thereby increasing the capacity of the air to pick up and retain moisture.

After passage through unit 42, the clean dry heated air passes mainly radially through sleeve 49 into the interior of drum 48 which is being slowly rotated by rotated motor 54. From drum 48 the now moist heated air passes through opening 58 into and through the blower. During passage of air through the wetted sleeve 49, water is entrained and evaporated into the air stream, and this moist air is discharged into the room for humidification of the space.

The moist air preferably is discharged through register 18 at slightly above body temperature usually about 105° F., to avoid draft conditions.

The control unit 69 is connected to the usual humidistat H which is preferably physically located in the room containing register 18, so that the room may be maintained at constant humidity.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by Letters Patent is:

1. A compact independent humidifier assembly for humidifying space in a building that is heated by hot water, steam, electricity or the like comprising a casing, internal transverse wall means defining adjacent humidifier and blower compartments within said casing, means defining an air intake opening in the casing for initially introducing air for said assembly into said humidifier compartment, an air filter mounted on the casing in the direct path of said air entering said opening, a heat

4

exchange unit mounted within the humidifier compartment having means for energizing it above the temperature of said incoming air disposed directly in the path of said filtered air, humidifier means comprising an annular body of porous water pick-up material driven at relatively slow speed by an electric motor and rotating with its lower section in a body of water, said body being disposed with its periphery adjacent said heat exchange unit directly in the path of said heated filtered heated air for entraining moisture during passage of said air through said humidifier compartment, a blower in said blower compartment connected through an aperture in said wall means to receive filtered heated moist air and discharge it through a casing outlet, and a relatively higher speed motor driving said blower, said casing outlet being adapted to be connected to a conduit for delivering the air to said space.

2. The humidifier assembly defined in claim 1, wherein said annular body is a sleeve of said plastic material mounted on a hollow support rotatable about an axis with the lower sector of the sleeve extending into said body of water, and said support is closed at the end opposite said aperture and open at the other to discharge heated filtered moist air directly into the blower inlet.

3. The humidifier assembly defined in claim 1, wherein said heat exchange unit is a radiator having an array of tubes through which hot fluid is passed and arranged to be traversed by the incoming filtered air.

4. The humidifier assembly defined in claim 1 wherein in a said air filter is a dry filter unit removably mounted in the casing between the casing air intake and the heat exchange unit.

5. The humidifier assembly defined in claim 1, wherein the air filter and heat exchange unit are disposed vertically and parallel to the axis of rotation of said sleeve.

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