Feb. 27, 1940. H. B. HALL 2,191,885

AIR CONDITIONING UNIT

Filed Nov. 1, 1937 2 Sheets-Sheet 1

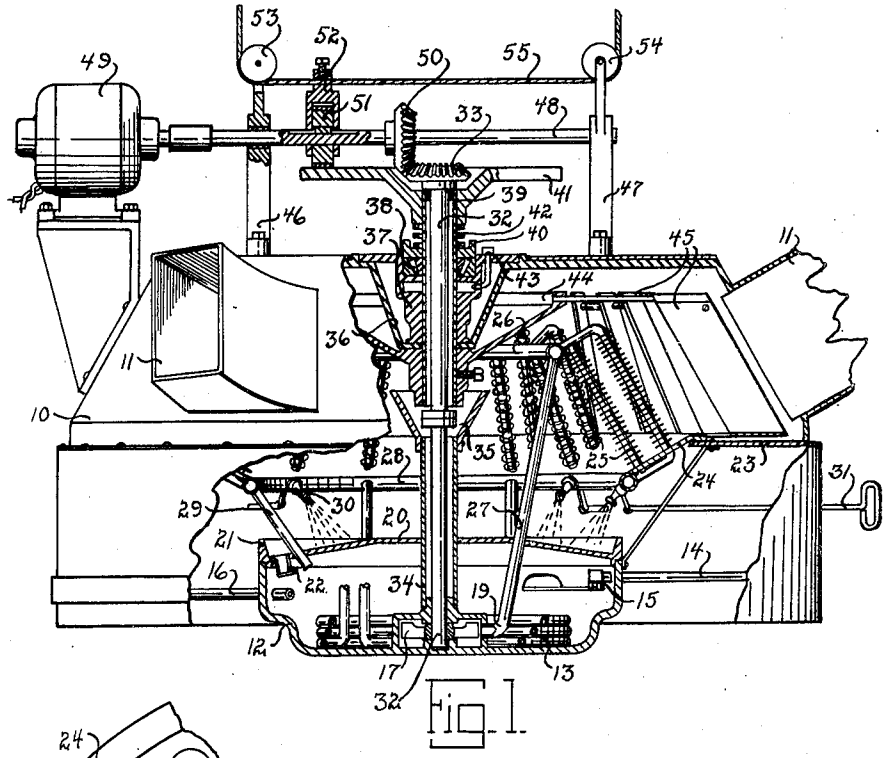


Fig. 1.

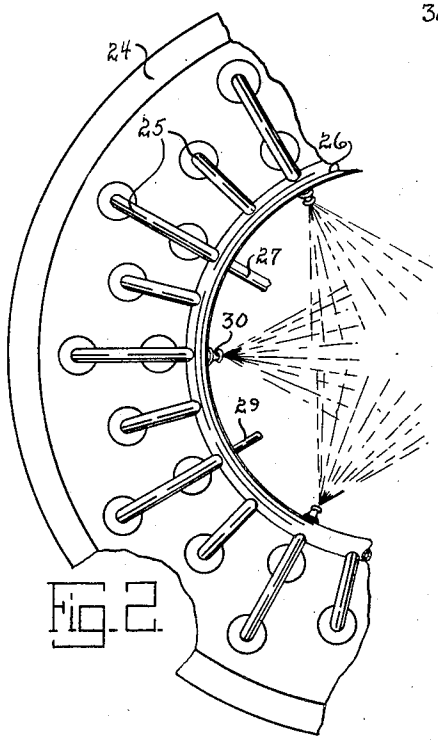


Fig. 2.

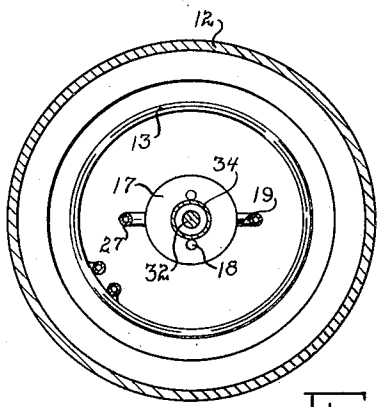


Fig. 3.

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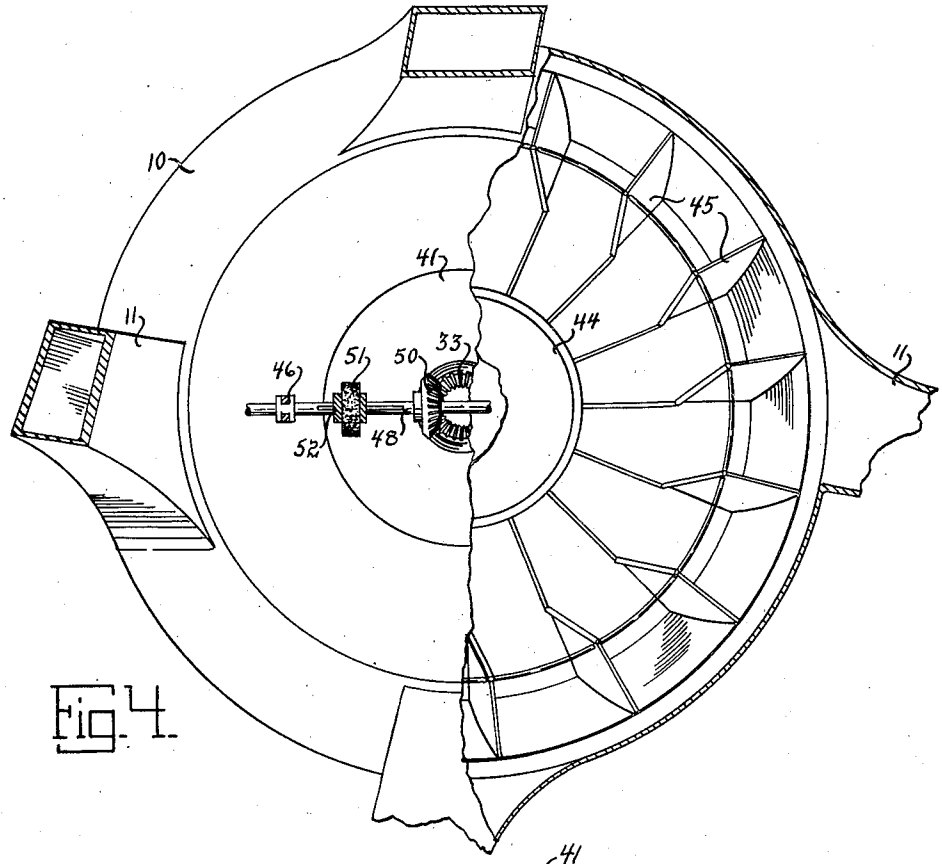


Fig. 4.

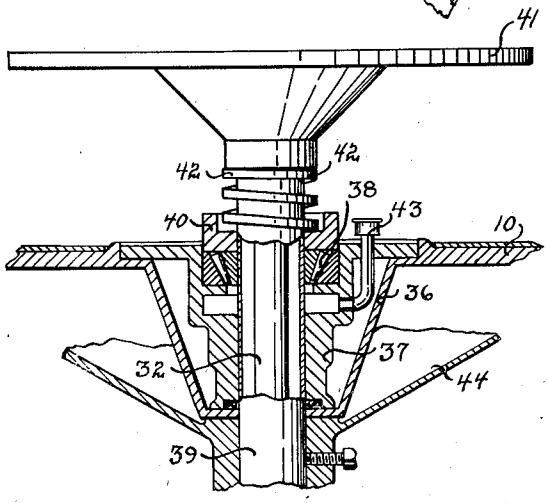


Fig. 5.

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UNITED STATES PATENT OFFICE

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AIR CONDITIONING UNIT

Hollis B. Hall, Newton, Iowa

Application November 1, 1937, Serial No. 172,212

3 Claims. (Cl. 257—215)

The principal object of this invention is to provide an air conditioning unit that utilizes the heating system within a home, office or the like for the circulation of conditioned air through the home, office building or the like.

A further object of my invention is to provide an air conditioning unit of efficient structure that may be readily substituted for the heating dome of a furnace providing a permanent installation for efficiently air conditioning living quarters.

A still further object of this invention is to provide an air conditioning unit that may be remotely controlled for the regulation of the volume of delivered conditioned air desired to the living quarters.

A still further object of my invention is to provide an air conditioning unit that will cool the delivered air in the summer time and that will raise the relative humidity of the delivered air when the heating apparatus is functioning.

A still further object of this invention is to provide an air conditioning unit having a built-in rotary type fan capable of delivering a large body of air and that may be adjusted to suit the needs and requirements of the individual.

A still further object of my invention is to provide an air conditioning unit of sturdy structure and that is completely adjustable and flexible in its control.

A still further object of this invention is to provide an air conditioning unit that is durable in use and economical in manufacture.

These and other objects will be apparent to those skilled in the art.

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 claims and illustrated in the accompanying drawings, in which:

Fig. 1 is a side partial sectional view of my complete air conditioning unit ready for use.

Fig. 2 is an enlarged top view of a portion of the liquid circulating and radiating system.

Fig. 3 is an enlarged top sectional view of the cooling chamber and coil of my device more fully illustrating its construction.

Fig. 4 is a top plan view of my air conditioning device with portions cut away to more fully illustrate its internal construction.

Fig. 5 is an enlarged side sectional view of the bearing element and friction disc used in my device and more fully illustrates its construction.

Heretofore, air conditioning devices, especially those for use in the home, have been of more or less hit or miss construction. These devices were either a portable unit of considerable bulk for cooling individual rooms or in the case of central plants, they necessitated special or individual conduits being placed throughout the home or dwelling for air conditioning. Both of these types of devices have serious disadvantages. They are extremely bulky and complicated, do not deliver a sufficient volume of conditioned air and are intricate in their control. Furthermore, devices heretofore often have merely been for the purpose of cooling, no thought being given to the relative humidity of the conditioned air. Due to the complex structure of these devices, considerable difficulty is encountered in their installation and, in the case of small homes, the extreme bulk of the mechanism of these devices takes up valuable space. I have overcome such disadvantages as will be appreciated and as hereinafter more fully set forth.

Referring to the drawings, I have used the numeral 10 to designate the shell of my device which may be used to replace the ordinary heating dome of a common hot air furnace. The numeral 11 designates the ordinary outlet flues in communication with the inside of the dome and leading to the ordinary registers through suitable conduits and into the living quarters of the home. It is within this dome that I place my device which I will now describe. I have used the numeral 12 to designate the cooling chamber of my device, having therein an ordinary refrigeration expansion coil 13 which may be connected to any suitable type of refrigerating compressor unit.

The numeral 14 designates a water inlet pipe in communication with a suitable source of water under pressure. The numeral 15 designates an ordinary float controlled outlet valve on one end of the pipe 14 within the chamber 12. The water enters the chamber 12, surrounding and covering the coil 13 until the water reaches such a depth as to operate the float valve 15, shutting off the supply of water to the chamber 12. The numeral 16 designates an overflow pipe for permitting water to flow out of the chamber 12 when it has reached a certain depth. I have used the numeral 17 to designate a centrifugal pump in the central bottom portion of the chamber 12 and having the intake openings 18 and outlets 19 in communication therewith as shown in the drawings. I have used the numeral 20 to designate the collector cover which is placed over the chamber 12, slopes downwardly from its center and has a detaining rim

21 around its marginal edge as shown in the drawings. The numeral 22 designates a flap valve adjacent the rim 21 and extending through the cover 20. This flap valve is for the purpose of admitting water, accumulated on top of the lid 20 to enter the chamber 12. I have used the numeral 23 to designate a horizontal ring secured within the housing 10 and extending about its circumference. The numeral 24 designates a supporting member having its outer peripheral edge secured to the member 23 and extending downwardly and inwardly toward its center as shown in Fig. 1. It is upon this inclined ring or supporting member 24 that I mount the radiating and circulating system of my device. The numeral 25 indicates a plurality of finned radiating elements. The numeral 26 designates a circular pipe in communication with the upper end of each of the radiating elements 25.

This pipe 26 is in communication through the pipe 27 with the outlets 19 of the centrifugal pump 17. I have used the numeral 28 to designate a second pipe in communication with the lower ends of each of the radiating elements 25. The numeral 29 designates a plurality of outlet pipes having one end in communication with the pipe 28 and their other ends in communication with the inside of the chamber 12. It will here be noted that the diameter of the ring pipe 28 is of the approximate diameter of the cover 20 of the chamber 12. I have used the numeral 30 to designate a plurality of spray nozzles in communication with the inside of the pipe 28 and so positioned that when they are in operation, they will spray directly upon the collector cover 20 in a manner as shown by dotted lines in Fig. 1. Each of these nozzles 30 has a common valve therein which is manually controlled by a lever or like 31. Thus when it is desired to cool the system, the ordinary compressor is set in operation, thereby cooling the coil 13, which in turn cools the water in the chamber 12. The centrifugal pump will force the water through the outlets 19 and thence into the pipe 26. This cooled water will then go through the radiating elements 25 into the pipe 28 where it will be returned to the chamber slowly through the outlet pipes 29, completing the circuit of the liquid radiating system. I have used the numeral 32 to designate a vertical shaft having its lower end in operative engagement with the centrifugal pump element 17 and having on its upper end a bevel gear 33.

The numeral 34 designates a sleeve surrounding the shaft 32 and extending up through the cover 20 for a substantial distance as shown in the drawings. The numeral 35 indicates a conically shaped deflector member on the upper end of the sleeve 34.

I have used the numeral 36 to designate a bearing well, formed in the upper central portion of the dome 10. The numeral 37 designates an elongated bearing member mounted within the well 36 as shown in Fig. 5 of the drawings. The numeral 38 designates a roller bearing within the elongated bearing member 37. Rotatably mounted in the roller bearing 38 and the elongated bearing 37 and extending downwardly through the bearing well 36 is a sleeve 39. I have used the numeral 40 to designate a spring receiving element rotatably mounted on the sleeve 39 above the roller bearing 38. The numeral 41 designates a horizontal friction disc having its central portion depressed and rigidly secured to the upper end of the sleeve 39. The numeral 42 designates a tension spring imposed between the spring retaining member 40 and the friction disc 41 as shown in the drawings. It will here be noted that the upper portion of the shaft 32 is rotatably supported within the sleeve 39 and is free to rotate independent of the rotation of the sleeve 39. The numeral 43 indicates an ordinary grease cup for forcing grease to the internal portions of the elongated bearing member 37 to allow for the free rotation of the shaft 39 within its respective bearing members. I have used the numeral 44 to designate a supporting plate rigidly secured by a set screw or like to the shaft 39. This supporting plate 44 is in the general shape of an inverted cone and is positioned within the housing 10.

I have used the numeral 45 to designate a plurality of vanes or blades secured to the supporting plate 44 and positioned adjacent the outer walls of the dome 10 to provide a blower fan. I have used the numerals 46 and 47 to designate bearing elements extending upwardly from the top of the housing 10 and in which is rotatably mounted a shaft 48.

The numeral 49 designates an ordinary electric motor in operative engagement with one end of the shaft 48. I have used the numeral 50 to designate a bevel gear secured to and operated by the shaft 48 and in operative engagement with the bevel gear 33 for driving the shaft 32 which in turn operated the centrifugal pump 17. Slidably mounted on the shaft 48 and prevented from independent rotation thereto is a friction gear 51 in frictional engagement with the disc 41. The numeral 52 designates a hanger through which the shaft 48 extends and which holds the friction gear 51 in alignment. The numeral 53 designates an ordinary pulley wheel rotatably mounted on the upper end of the bearing member 46 above the shaft 48. Similarly, the numeral 54 designates a pulley wheel rotatably mounted on the bearing member 47 above the shaft 48. The numeral 55 designates an operating cable in engagement with the pulley wheels 53 and 54 and secured to the hanger 52. The ends of the cable 55 may be secured to any type of remote control for pulling the cable 55 in either of its directions. By this construction, when the end of the cable 55 adjacent the pulley 54 is pulled upwardly, the hanger 52 and friction gear 51 will be pulled toward the central portion of the disc 41, thereby increasing the speed of rotation of the disc 41. Similarly, when the end of the cable 55 adjacent the pulley 53 is pulled, the hanger 52 will be pulled outwardly relative to the central portion of the disc 41, causing the friction wheel 51 to engage the outer marginal edge of the disc 41, consequently causing the slower rate of revolution of the disc 41. As the disc 41 is directly coupled to the fan elements or blades 45 through the medium of the sleeve 39 and the supporting plate 44, the relation of the friction gears will govern the rate of rotation of the fan, while at the same time the speed of rotation of the centrifugal pump will be relatively constant.

The practical operation of my device is as follows: The ordinary compressor unit is hooked into the circuit or coil 13. The pipe 14 is placed in communication with a suitable source of water under pressure and the device is ready for operation. Water will enter through the float valve 15, into the chamber 12 which will be filled to a pre-determined level. This motor 49 is placed

in operation rotating the shaft 48 which rotates the bevel gear 50, thereby rotating the bevel gear 33, the shaft 32, and operating the centrifugal pump 17. The water within the chamber 12 is cooled by the coil 13 and is picked up by the pump 17, discharged through the outlet 19, the pipe 27, and thence through the radiating elements 25. The friction gear 51 will rotate the disc 41, thereby rotating the sleeve 39 which rotates the fan supporting member 44, causing the fan blades to force air out through the conduits 11. This pulls air from the lower portion of the furnace or the cold air conduit of the furnace, up through the dome 10 toward the central portion or within the ring formed by the pipe 28, allowing it to circulate about the radiating elements 25 and thence be forced out through the conduits 11. The speed of rotation of the fan can be readily controlled by moving the hanger 52 and friction gear 51 to various positions or arcs of rotation relative to the disc 41.

The cool water, after passing through the radiating elements 25, collects in the pipe 28 where it is discharged through the pipes 29 into the chamber 12. Thus the circuit of the water is complete and water discharged from the pipes 29 is again cooled by the coil 13.

When it is desired to raise the relative humidity within the living quarters without cooling it, the valve handle 31 is actuated, thereby opening the nozzle 30. This allows the water that has passed through the elements 25 to spray onto the top or cover 20. The air sucked through the device by the fan 45 will pass through the spray of water and pick up molecular parts of the water, thus raising the relative humidity of the air forced through the ducts or conduits 11. The water sprayed on the top 20 is retained by the rim 21 and will flow out through the flap valve 22 back into the chamber 12 where it may be used over again or if it adds an excess to the bulk of water in the chamber 12, will pass out through the overflow pipe 16. It will be noted by the construction of the upper bearing element that the bearings proper are kept away from heat and are sealed within the well 36. The spring 42 acts to keep the disc 41 in yielding contact with the friction gear 51. By this construction, the pump 17 will be driven at a constant speed relative to the speed of the motor while the speed of the fan blades 45 can be controlled by shifting the hanger 52 and the friction gear 51 to various positions relative to the center of the disc 41. This relative ratio of gear 51 to the gear or disc 41 is controlled by pulling on either end of the cable 55 in the usual manner. In common use, the entire dome or housing 10 is placed on top of the furnace replacing the ordinary heat dome of the furnace. Thus the heat from the furnace, when the furnace is in operation, will travel up into the dome about the chamber 12, thence inwardly and up through the ring opening formed by the pipe 28 and out through the conduits as herebefore explained.

Thus the relative humidity of the air discharged through the elements 11 can be regulated by the amount of spray from the nozzles 30 to a very fine degree.

The fan construction of my device is unique in that the blades or fins 45 have their lower ends secured to a ring and their upper ends secured to the element 44 by simple rods or the like. The assembly is further strengthened by the use of a spacer ring or the like as shown in the drawings. Thus the fan provided is of high efficiency while at the same time being economical in its structure.

Obviously, this fan assembly is of great utility and may be used in the furnace or dome of the furnace for the circulation of air through the radiating system with or without the cooling elements.

It will be noted, too, that the supporting member 24 may be sectioned with several of the radiating elements 25 mounted thereon and one inlet pipe 27 connected to each of the sections. This structure increases the ease of assembly of a device as well as permitting a more uniform distribution of water or cooled liquid through the radiating system.

Obviously, when the furnace is not in operation and the cooling system is functioning, the spray nozzles may be placed in operation, thus pre-cooling the delivered air before the air passes in contact with the radiating elements 25, or if the temperature of the water be satisfactory, the water alone is all that is necessary to cool the radiating system.

Thus it will be seen that I have provided an air conditioning device that fulfills all of my objects and presents many advantages. My device can be permanently installed, does not take up excessive space, provides for the complete conditioning of air at all times of the year, may be attached to the furnace permanently, is adjustable as to volume of air delivered, flexible in its control, highly efficient in its operation, and it permits the use of any one or all of the elements involved to be used independent of the other elements.

My device is readily adaptable to any type of heating installation.

Some changes may be made in the construction and arrangement of my improved air conditioning unit without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims any modified forms of structure or use of mechanical equivalents which may be reasonably included within their scope.

I claim:

1. In combination with an air conditioning unit having a housing designed to be placed over a furnace or like, a plurality of outlets in said housing, a pump in said housing and a rotary fan having its plates adjacent the outlets in said housing and rotatably mounted therein, a transmission means for operating said fan and said pump comprising, a depressed cup portion in the upper surface of said housing, a bearing element in said depressed portion, a sleeve rotatably mounted in said bearing element having its lower end operatively secured to said rotary fan for driving said fan, a friction disc on the upper end of said sleeve exterior of said housing, a motor, a horizontal shaft secured to said motor, bearing members secured to said housing for supporting said shaft, a friction gear slidably mounted on and in operative engagement with said shaft and contacting said friction disc, a means for manually sliding said friction gear on said shaft; said friction gear changing the speed of rotation of said fan through the medium of said sleeve when moved along said shaft relative to the center of of said friction disc, a bevel gear secured to said shaft, a vertical drive shaft rotatably mounted in said sleeve and having its lower end secured to said pump for driving said pump, and a second bevel gear secured to the upper end of said ver-

tical drive shaft in operative engagement with said first mentioned bevel gear.

2. In combination with an air conditioning unit having a housing, a plurality of outlets in said housing, a rotary fan having its blades adjacent the outlets in said housing and rotatably mounted therein, a plurality of radially disposed radiating elements adjacent said rotary fan and a pump for pumping fluids through said radiating elements, a transmission for driving said fan and said pump comprising, a cup portion depressed in the upper portion of said housing, a bearing element in said cup portion, a sleeve rotatably mounted in said bearing element, a supporting plate secured to the lower end of said sleeve inside said housing, a means for securing said supporting plate to said rotary fan plates, a friction disc on the upper end of said sleeve, a motor, a horizontal shaft secured to said motor, bearing members for supporting said shaft, a friction gear slidably mounted on and in operative engagement with said shaft and contacting said friction disc, a means for sliding said friction gear on said shaft; said friction gear changing the speed of rotation of said fan when moved along said shaft relative to the center of said friction disc, a bevel gear secured to said shaft, a vertical drive shaft having its lower end in operative engagement with said pump and rotatably mounted in said sleeve, and a second bevel gear secured to the upper end of said vertical drive shaft and in operative engagement with first mentioned bevel gear.

3. In combination with an air conditioning unit having a housing, a plurality of outlets in said housing, a rotary fan having its blades adjacent the outlets in said housing and rotatably mounted therein, a plurality of radially disposed radiating elements adjacent said rotary fan and a pump for pumping fluids through said radiating elements, a transmission for driving said fan and said pump comprising, a cup portion depressed in the upper portion of said housing, a bearing element in said cup portion, a sleeve rotatably mounted in said bearing element, a supporting plate secured to the lower end of said sleeve inside said housing, a means for securing said supporting plate to said rotary fan plates, a friction disc on the upper end of said sleeve, a means for yielding holding said friction disc in a forwardly direction, a motor, a horizontal shaft secured to said motor, bearing members for supporting said shaft, a friction gear slidably mounted on and in operative engagement with said shaft and contacting said friction disc, a means for sliding said friction gear on said shaft; said friction gear changing the speed of rotation of said fan when moved along said shaft relative to the center of said friction disc, a bevel gear secured to said shaft, a vertical drive shaft having its lower end in operative engagement with said pump and rotatably mounted in said sleeve, a second bevel gear secured to the upper end of said vertical drive shaft and in operative engagement with first mentioned bevel gear, bevel gear, a sleeve enclosing the end of vertical drive shaft, and a deflecting cone on the upper end of said sleeve for deflecting heat from said bearing portions.

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