Dec. 5, 1939. G. L. USSELMAN 2,181,953

COOLING SYSTEM

Filed March 24, 1936

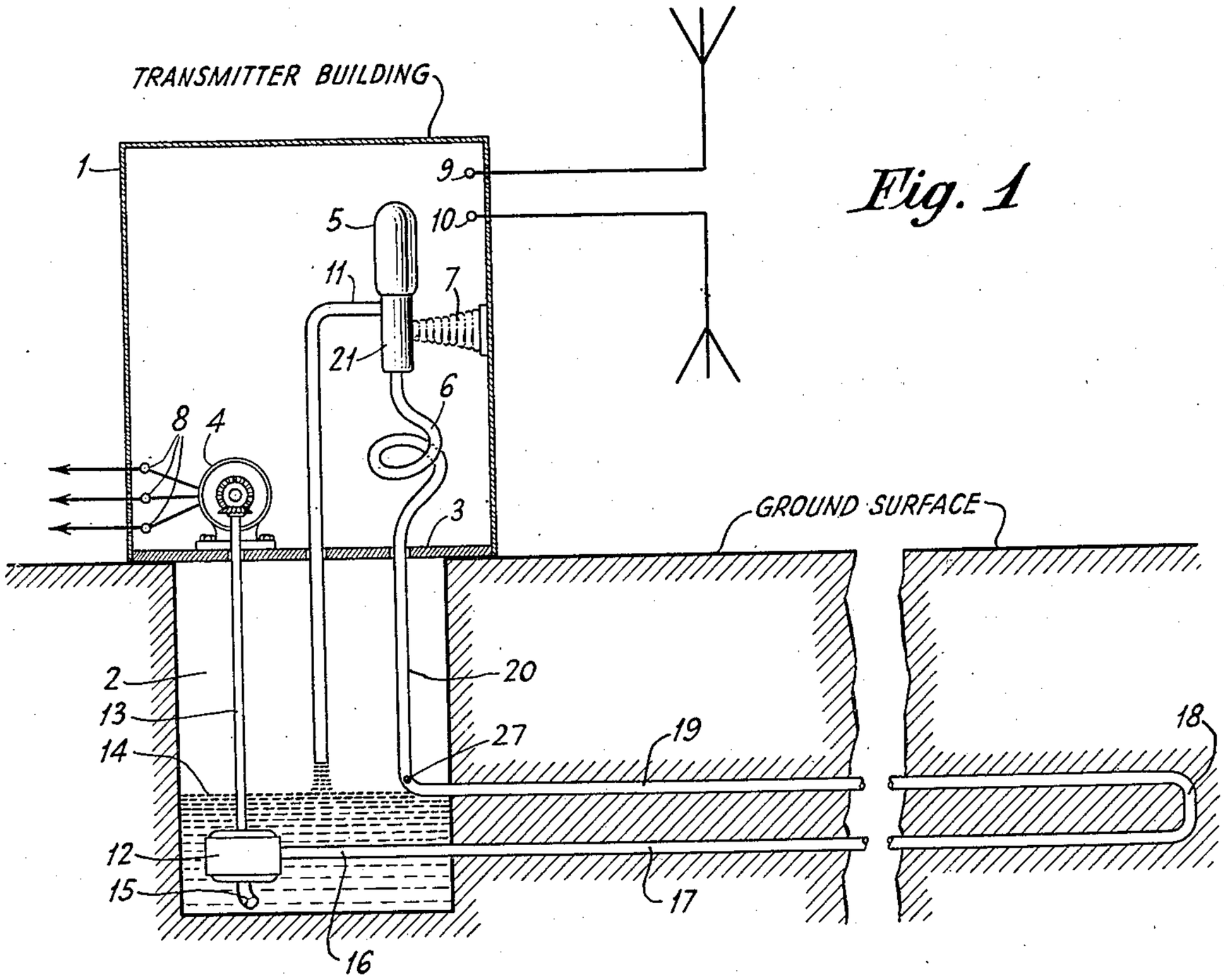
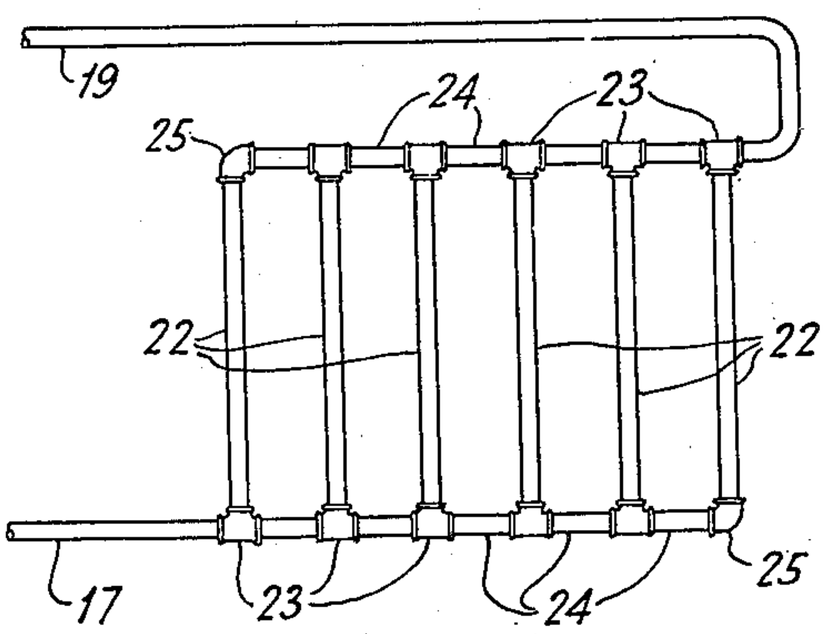
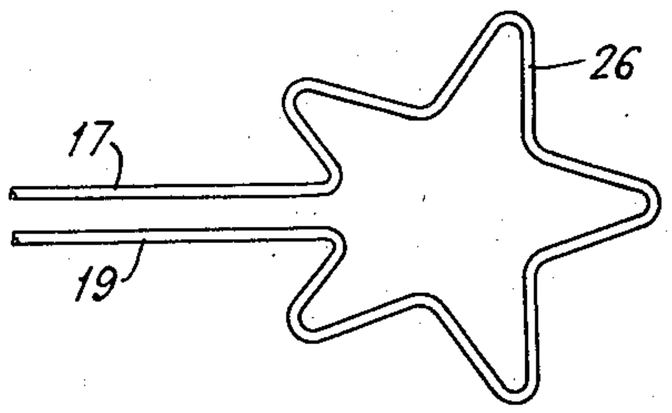


Fig. 1

Fig. 2

Fig. 3





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COOLING SYSTEM

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1 Claim. (Cl. 62—1)

This invention relates to a new and novel cooling system which is particularly adapted to cooling the tubes of a radio transmitter located in a more or less isolated region.

An object of this invention is to provide a system for cooling the tubes of a radio transmitter by having the circulating cooling fluid forced through a system of pipes or reservoirs buried below the surface of the ground.

A feature of this invention is a novel means of combining a reservoir below the ground level of a transmitter building and connecting the reservoir with an underground system of circulating pipes which is cooled by the passage of a circulating fluid through the pipes.

While cooling systems generally are well known in the art, they are of the ordinary or open-surface type. Such cooling systems are subject to several disadvantages, the principal one being that the cooling fluid generally evaporates more or less rapidly and in systems employing water as a circulating cooling fluid, it is generally likely to freeze in cold weather. These serious disadvantages are overcome by this invention.

This invention is particularly desirable when it is found necessary to locate one or more transmitters away from the main or central transmitting plant for the purpose of reducing the length of the antenna transmission line. Also, it is frequently desirable to locate the transmitter near the antenna without the use of the usual housing by substituting an outdoor transmitter covered only by a small housing or shed. In such remotely located transmitters because of the general absence of the ordinary water mains, it is necessary that a reliable evaporation proof, freeze-proof, closed or semi-closed cooling system be employed.

Briefly, this invention consists of a system of pipes or reservoirs buried in the ground below the frost line, which is deep enough to insure good cooling. Such an arrangement tends to maintain the cooling fluid at a fairly constant temperature both in winter and summer.

This invention will be more completely understood by referring to the accompanying drawing, in which:

Fig. 1 is a sectional view of the general cooling arrangement;

Fig. 2 is a detail of the cooling pipes, parallel arranged; and

Fig. 3 is a detail of a star-shaped arrangement of cooling pipes.

Referring now in detail to Fig. 1, the transmitter housing 1 is shown located above a reservoir or sump pit 2. Mounted upon the floor 3 of the housing 1 there is located a motor 4, water-cooled transmitter tube 5 and cooling coil 6, the transmitter tube 5 being insulatedly secured on the wall of housing 1 by insulator 7. The housing 1 is provided with suitable power supply leads 8 and also antenna leads 9 and 10. An outlet insulated pipe 11 returns the circulating fluid to the reservoir 2. Located in the sump pit 2 is a pump 12 which is preferably of the vertical type and may be driven by a shaft 13 extending down from motor 4. The level of the water or circulating fluid in reservoir 2 may be maintained at any desired level, preferably at a level indicated at 14, which is a little higher than the pump 12. The pump inlet 15 located at the lower level of reservoir 2 draws water or any suitable cooling fluid to pump 12, which forces it through the pump outlet pipe 16 into the lower pipe 17. The liquid travels the length of the pipe 17 up the short pipe 18 and into pipe 19, thus returning to the reservoir 2. At this point, it rises up in a pipe 20 through the insulating coil 6 which is usually a rubber hose, into transmitting tube or tubes 5 and returns to the reservoir by means of outlet pipe 11. During this circuit travel of the liquid, it is cooled by delivering its heat into the ground. The cooling fluid from pipe 20 passing through the insulating tube of rubber or glass or other insulating material circulates into the bottom of tube jacket 21. The water jacket of tube 5 absorbs the heat from the tube anode which is inside the tube jacket and flows out at the top of the tube jacket into outlet pipe 11. It is desirable to have a small drain hole 27 in the lower end of pipe 20 to allow the liquid in the upper section of this pipe and in the tube water jacket to drain in order to prevent freezing when the transmitter is shut down.

Referring now to Fig. 2 of the drawing, there is shown a specific modification of cooling pipes wherein the submerged cooling pipes 17 and 19 are connected with a plurality of parallel arranged pipes 22, which are connected together by T fittings 23 and short links 24, the last pipe being connected by elbows 25. Such an arrangement of parallel pipes is particularly desirable where it is necessary to obtain additional cooling surface without making the water circuit as long.

In Fig. 3, another circulating pipe arrangement is shown wherein pipes 17 and 19 are spread out in the ground by the star-shaped pipe arrangement 26. While several arrangements of cooling pipes and a single arrangement of transmitter and reservoir is shown, it is distinctly

understood that this invention is not to be limited to the one shown but is capable of taking other modifications and therefore should not be limited to those shown, except such limitations as are clearly imposed in the appended claim.

What is claimed is:

The combination with a radio transmitter of a cooling system therefor, said transmitter including an element which generates heat in the normal operation thereof, said system including a subterranean pool of liquid, said element having a liquid inlet and liquid outlet to permit a liquid flow therethrough, a pipe system having a first portion connected to the inlet of said element to maintain said liquid in heat absorbing relation therewith, a second portion of said pipe system in series with the first mentioned portion to maintain said liquid in heat exchange relation with the ground below the surface thereof, said first mentioned portion having an outlet pipe connected to the outlet of said element and arranged to discharge said liquid into said pool after it passes through said element, a pump arranged to draw liquid from said pool and force it through the pipe system, element, outlet pipe and back to said pool, and a small aperture in the lower part of said first mentioned portion of said pipe system to permit drainage of the liquid from said element when the pump is inoperative.

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