Jan. 14, 1941. T. S. JOHNSON ET AL 2,228,766

APPARATUS FOR SATURATING THE FIBROUS COVERING OF WIRE

Filed Feb. 23, 1939 2 Sheets-Sheet 1

Fig. 1.

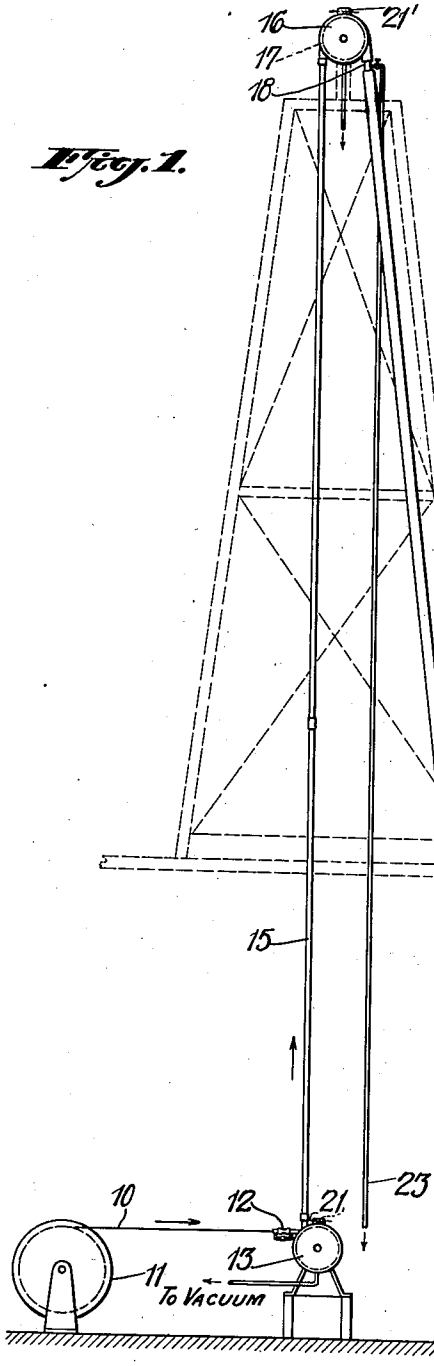
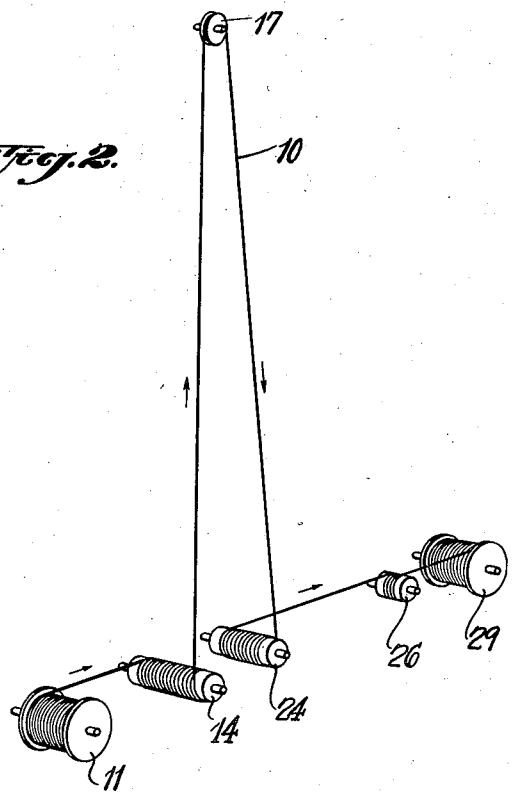


Fig. 2.



INVENTORS

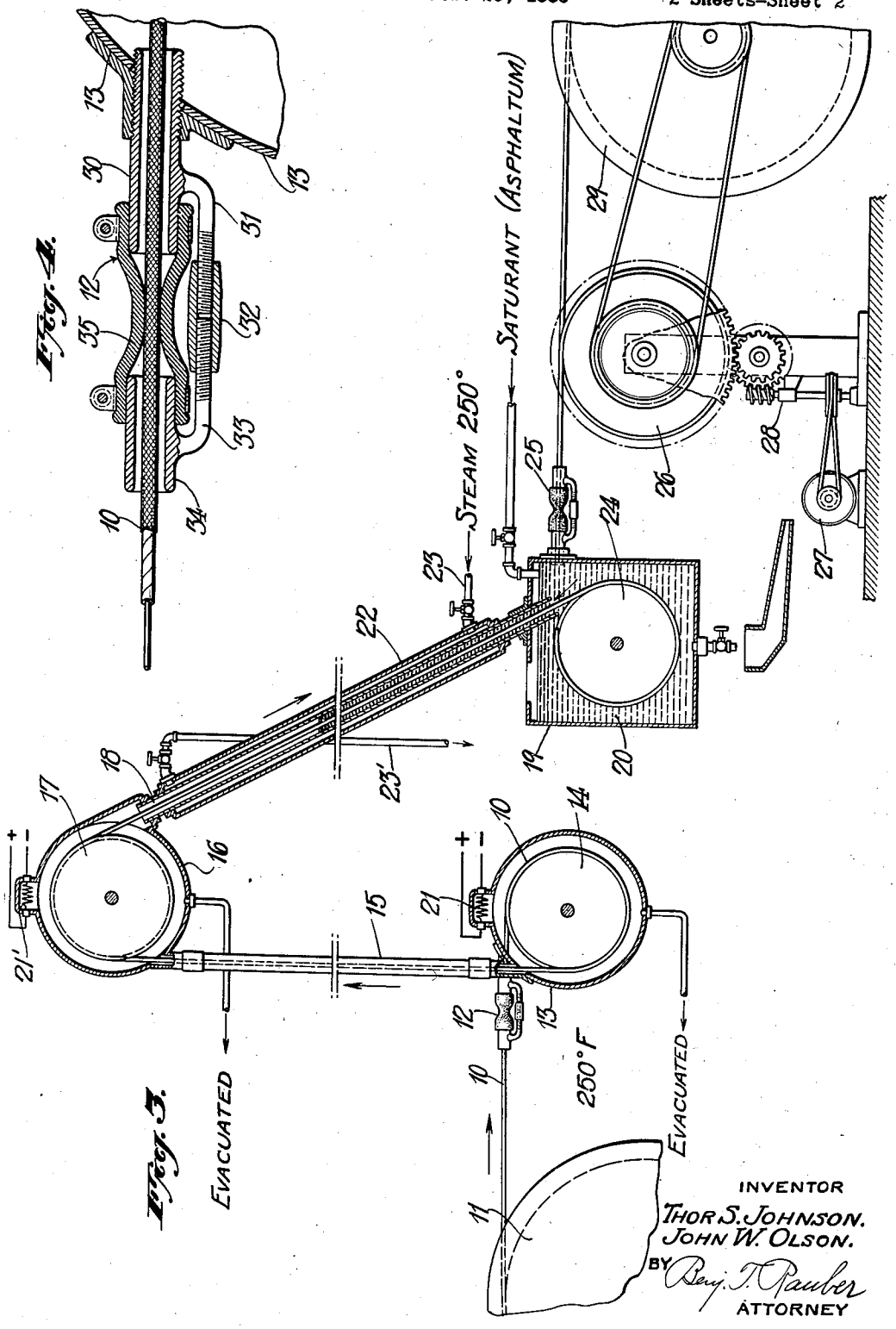
THOR S. JOHNSON.
JOHN W. OLSON.

BY Benj T. Rauber ATTORNEY

Jan. 14, 1941. T. S. JOHNSON ET AL 2,228,766

APPARATUS FOR SATURATING THE FIBROUS COVERING OF WIRE

Filed Feb. 23, 1939 2 Sheets-Sheet 2



Patented Jan. 14, 1941 2,228,766

UNITED STATES PATENT OFFICE

2,228,766

APPARATUS FOR SATURATING THE FIBROUS COVERING OF WIRE

Thor S. Johnson, Irvington, and John W. Olson, Hastings on Hudson, N. Y., assignors to Anaconda Wire & Cable Company, New York, N. Y., a corporation of Delaware

Application February 23, 1939, Serial No. 257,894

1 Claim. (Cl. 91—18)

Our invention relates to an apparatus whereby the fibrous coverings of eelctric conductors, such as wires or cables, may be saturated with molten compounds in a continuous manner.

Certain types of wire used for electric conductors are covered with an insulating covering consisting of a fibrous material, such as paper impregnated with a bituminous or asphaltic saturant, which serves to preserve the paper, to prevent access of moisture and to improve the dielectric or insulating properties of the paper. An example of a wire or conductor of this type is shown in Olson Patent No. 2,048,886 in which the wire is first covered with strips of paper and then with a braided sheath to protect the paper against mechanical injury. The whole structure is then completed by treating with a saturating material.

It is very desirable to use a hard tough paper for the wrapping immediately in contact with the conductor. Such a wrapping would be a craft paper, preferably of the wrinkle-krinkle type. When a wire wrapped with a heavy dense paper of this type is saturated in the usual manner by merely dipping it into a molten saturant, the saturant material does not penetrate the paper completely and thoroughly, or it cannot be depended upon to penetrate freely and thoroughly. In consequence, the protection of the insulation against the entrance of moisture is imperfect and the insulating qualities of this layer are therefore imperfect.

In our present invention we provide an apparatus whereby the fibrous covering of wires or cables may be perfectly saturated in a continuous manner even when the fibrous covering is of a heavy dense nature such as is not readily penetrated by the saturating material.

In the operation of our invention the wire or cable covered with the fibrous covering is passed lengthwise or continuously into a vacuum chamber where it is heated and remains for a sufficient time to expel substantially all air and moisture. For example, a vacuum having an absolute pressure of 20 millimeters may be employed and the wire or cable heated to a temperature of approximately 250° F., under which conditions the cable will be freed from substantially all vapors and gases.

The cable or wire passes continuously into the chamber through a seal which prevents air from entering about the cable so that the only air introduced in the vacuum is that within the cable or wire wrapping. The wire or cable remains in the vacuum chamber and subjected to vacuum treatment for a sufficient period of time to permit the complete withdrawal of air from it. During this vacuum treatment the cable is brought to a sufficient vertical height and then passes downwardly into hot or molten saturating material which seals a downwardly opening outlet of the vacuum chamber. Consequently the wrappings of the wire or cable enter the hot saturating material while still freed from all vapors and gases and with their pores or spaces completely vacuumized. Consequently the hot saturating liquid readily enters the minute vacuum spaces within the fibrous structure and thoroughly penetrates and saturates the fibrous material. As this material passes downwardly through the hot molten saturating material, the pressure of the liquid increases to atmospheric pressure at the time that the cable leaves the exit end of the vacuum chamber. This facilitates the penetration of the saturant into the spaces in the fibrous material. The wire or cable may then be readily withdrawn under atmospheric pressure. The saturating tank thus serves as a liquid seal for the exit end of the vacuum chamber.

The various features of the invention are illustrated by way of example in the accompanying drawings, in which—

Fig. 1 is a diagrammatic elevation of apparatus embodying our invention.

Fig. 2 is a diagrammatic sketch showing the travel of the wire or cable in the apparatus of Fig. 1.

Fig. 3 is an elevation of the apparatus of Fig. 1 foreshortened and on a larger scale, and with parts broken away to show the interior of the apparatus.

Fig. 4 is an entrance seal to the vacuum chamber.

In the apparatus illustrated in the accompanying drawings, a wire or cable 10 having a fibrous coating to be saturated is drawn from a drum 11 through a seal 12 into a vacuum drum 13. After entering the drum 13 the wire is wrapped several times around a rotating drum 14 so as to provide a sufficient period for the withdrawal of all air and occluded vapors or gases; thence the wire passes upwardly through a substantially vertical tube or passageway 15 extending upwardly from the drum 13 in a line approximately tangent to the periphery of the drum 14. The passageway 15 forms an extension of the vacuum drum 13 and connects it with an upper chamber 16 of the vacuum system in which there is a rotatable sheave 17. The wire or cable which is still subjected to vacuum treatment in passing upwardly through the passageway 15 and into the chamber

16 then passes over the sheave 17 and downwardly into a downwardly extending conduit or passage 18, the lower end of which extends into a tank 19 into which dips the lower end of the conduit 18.

During its passage through the drum 13 and chamber 16, the wire or cable is heated by any suitable means. Such means is indicated diagrammatically by electric heating coils 21 in the chambers 13 and 16. It will be understood that these heating means are indicated merely diagrammatically and that the position and arrangement of the heating means may be varied or changed, or that other means may be employed. The heating of the cable serves to vaporize any adsorbed moisture in the fibers and decreases the adsorbing tendency of the fibrous material and, therefore, facilitates the withdrawal of the gases from the vacuum. Sufficient time is afforded by the passage of the wire or cable about the drum 14 and the sheave 17 and the passage through the pipe or conduit 15 to permit all of the water and gases to be withdrawn from the fibrous coating. For example, fifteen minutes treatment at a high vacuum before immersion in the saturant is generally sufficient to remove all moisture, vapors and gases.

The tank 19 is heated to maintain the saturant in a mobile liquid condition. In order to prevent chilling and solidifying of the saturant that is drawn upwardly into the tube 18, the latter is heated by any suitable means. For example, with a saturant that melts and forms a highly fluid liquid at 250° F., or lower, the conduit 18 may be heated by a steam jacket 22 to which steam may be admitted through a pipe 23 and exhausted through a pipe 23'.

On entering the tank 19 the wire is wrapped about a drum 24 a sufficient number of turns to keep it in the saturant bath 20 until the fibrous material is completely saturated. Then the wire is drawn from the tank through a wiper 25 which may, or may not, be of the same construction as the seal 12, and passes about a capstan 26 which is driven from a motor 27 through a suitable drive 28. Then the wire or cable passes onto a winding drum or reel 29.

The seal 12 may be of any suitable construction, but that shown in section in Fig. 4 is preferred. In this construction the seal 12 is formed and a stationary tubular part 30 fastened in the wall of the tank 13 and has a threaded stem 31 extending parallel to its free end. This threaded end is joined by means of a turnbuckle 32 to the oppositely projecting stem 33 of a collar 34 whereby by turning the turnbuckle 32 in one direction or the other, the collar may be brought toward, or separated from, the tube 30. The space between the tube 30 and the collar 34 is spanned by a piece of rubber tubing 35 securely fastened at its opposite ends to the tube 30 and collar 34. When the collar 34 is moved away from the tube 30, the rubber tubing 35 stretches and contracts and, in this way, may close tightly about the passing cable 10, preventing leakage of air about the latter, while yet avoiding undue friction.

Through the above invention we are enabled to saturate wrappings of dense, hard paper such as craft paper uniformly and thoroughly with an impregnating bituminous or asphaltic liquid as, for example, with a blown asphalt. Very effective insulating qualities are imparted to the wrappings in this manner. For example, a cable formed of a wrapping of wrinkle-krinkle paper saturated by our process with a blown asphalt has a high dielectric or insulating property and is resistant to deterioration by water or moisture. A sample of such a wire after immersion in water for sixteen hours required voltages of over 10,000 volts to break through. This is not only higher than any voltages and moisture protection that could be obtained on this paper by ordinary saturation, but is higher than that obtainable with non-vacuum saturation or immersion of readily saturable material, such as the porous material used for paper toweling.

What we claim is:

A vacuum chamber for receiving a continuous length of electric conductor having a fibrous wrapping, said vacuum chamber having a seal for said conductor comprising separable tubular members, a rubber tubing engaged at its ends to said tubular members and spanning the distance therebetween, and means to separate said tubular members to stretch and contract said rubber tubing.

THOR S. JOHNSON.
JOHN W. OLSON.