

Nov. 9, 1943.

E. G. GAYNOR

2,333,995

REACTOR

Filed Aug. 2, 1941

Fig. 1.

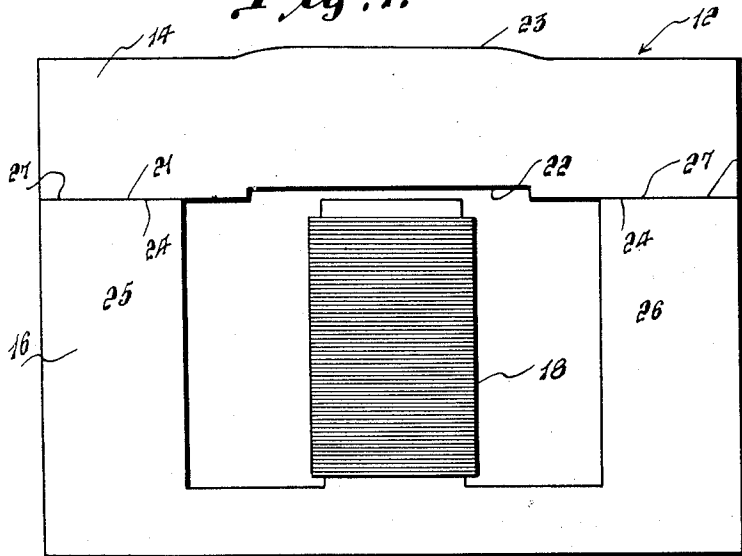


Fig. 2.

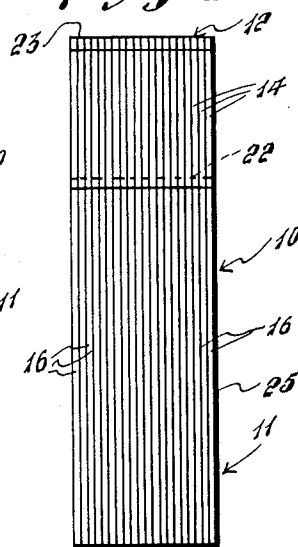


Fig. 3.

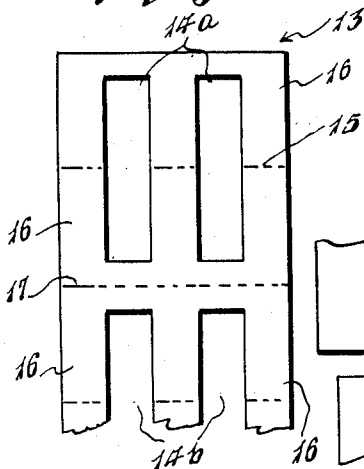


Fig. 5.

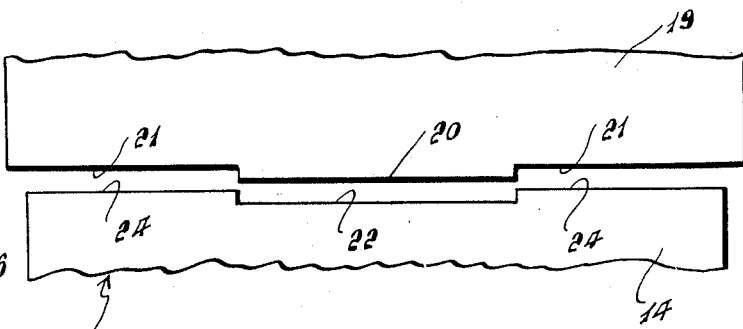


Fig. 4.

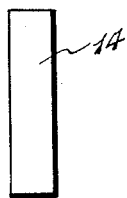
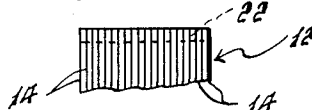


Fig. 6.



Inventor

Edwin G. Gaynor

By

John H. Hawshaw

Attorney

UNITED STATES PATENT OFFICE

2,333,995

REACTOR

Edwin G. Gaynor, Fairfield, Conn.

Application August 2, 1941, Serial No. 405,271

8 Claims. (Cl. 175-356)

This invention relates to new and useful improvements in reactors and has particular relation to a construction of reactor and to a method of making the same.

The objects and advantages of the invention will become apparent from a consideration of the following detailed description taken in connection with the accompanying drawing wherein a satisfactory embodiment of the invention is shown. However, it is to be understood that the invention is not limited to the details disclosed but includes all such variations and modifications as fall within the spirit of the invention and the scope of the appended claims.

In the drawing:

Fig. 1 is a front elevational view illustrating the reactor of the invention;

Fig. 2 is an end elevational view of the same;

Fig. 3 is a plan view suggesting the manner in which the laminations of the reactor are blanked from a strip;

Fig. 4 is a plan view of a keeper lamination as blanked from the strip;

Fig. 5 is a plan view showing the operation of pressing a stack of the keeper laminations to shape and finish them in accordance with the invention; and

Fig. 6 is an end view of the upper portion of said stack of laminations after being pressed.

Referring in detail to the drawing the reactor of the invention is generally designated 10 and comprises a body 11 of E-shaped laminations and a keeper 12 of bar-like laminations. Generally the laminations are punched and cut from strip stock of the proper width as suggested in Fig. 3 wherein at 13 is shown a strip of magnetic material suitable for use in a reactor.

Pieces 14 (see Fig. 4) are punched from strip 13 leaving slots 14a, and thereafter the strip is severed as along the dotted line 15, cutting off from the strip an E lamination 16. Then the strip is fed forward, severed along the dotted line 17, providing a second E lamination 16, and pieces 14 are punched from another portion of the strip leaving slots 14b. The described process is repeated to supply the desired number of keeper laminations 14 and E laminations 16 and it will be noted that the process provides an equal number of each such laminations.

Heretofore the desired number of each lamination has been assembled to provide a body and a keeper and a coil has been mounted on the center leg of the body 11 and paper or the like interposed between the free ends of the outer legs of the E laminations of the body and the

keeper 12. The thickness of the spacers thus used has depended on the impedance desired in the reactor being manufactured. These spacers are not dependable as very slight variations in the spacing of the body 11 and keeper 12 have very material effects on the impedance of the completed reactor and for this reason the production of reactors all uniform, one to the next, has not heretofore been attained.

In addition the use of the spacers results in the formation of a strong stray field outside the body of the reactor, about the spacers from the body 11 to the end of the keeper 12. Thus the described type of reactor if put in a magnetic metal case, or put near iron or other magnetic material, causes a vibration and an annoying hum or noise. When put in a magnetic metal case, having a close fit, the above mentioned magnetic leakage passes through such case, bypassing the spacers, and changing the characteristics of the reactor.

According to the present invention reactors of identical impedance may be made in large quantities at relatively low cost. In addition in the reactors of the invention the strong stray field is eliminated whereby a greater range of materials are usable for the purpose of mounting or secreting the reactors. I assemble the E-shape laminations in any or the usual manner to provide body 11 and mount the proper coil 18 on the center leg of such assembled body in any or the usual manner.

The desired number of laminations 14 are assembled into side-by-side relation and clamped together. Then these assembled laminations are treated in a press. Fig. 5 suggests this operation and in that Fig. 19 indicates a die having a forwardly projecting portion 20 and flat surfaces 21 at each end of such portion. Portion 20 is raised an amount depending on the impedance factor of the reactor being manufactured and is usually raised from two to twenty-five thousandths of an inch.

Die 19 is mounted in a press (not shown) the work holder of which is made to receive the laminations 14 of a complete keeper 12 and is relieved in its portion opposite the mid-portion of the inner edge of such laminations. By any suitable means the laminations are held tightly against one another with their edges aligned. As the press is closed the raised die portion 20 engages the mid-portions of the keeper laminations and depresses such portions as at 22 in Figs. 1 and 5.

Since the laminations are held tightly against

lateral displacement the metal displaced by the die is forced outwardly at the rear edges of the laminations as at 23 in Figs. 1 and 2. In this pressing operation the end portions 21 of the die engage the surface portions 24 of the keeper at the opposite ends of the depression 22 with the result that burs and the like are pressed flat and the surface portions 24 of the keeper are left smooth and flat. As an alternative method the individual laminations may have the depressions pressed therein and thereafter the laminations are assembled with the depressions aligned.

Thereafter the keeper 12 is assembled on the body 11 with the surface portions 24 of the keeper tight and flat against the free ends of the outside legs 25 and 26 of the body as at 27 in Fig. 1. This assembly with the depression 22 facing the free end of the center leg of the body leaves a space between the keeper and such center leg. Such space determines the impedance of the reactor. Therefore, as, through the use of the die, the depth of the depression 22 may be made exactly the depth desired the impedance of the reactor may be accurately determined and duplicate reactors, or reactors having duplicate impedance factors, may be produced at relatively low cost.

With the described construction the surface portions of the keeper are flat against the free ends of the outside legs of the body 11 making for efficiency and uniformity in the reactor. There is no by-passing of the magnetic circuit about any insulator or spacer and the magnetic circuit is completely closed and the flow is entirely within the laminations. Therefore the reactor of the invention may be placed in a case of magnetic material without any material change in the characteristics of the reactor and with a minimized vibration or noise resulting in the complete device.

The reactors of the invention may be made at low cost in quantity and of uniform impedance and they will retain their predetermined characteristics during long use. Where paper or the like is used as a spacer between the keeper and the body of the reactor the paper is not of uniform thickness and deteriorates in time. For these and other reasons uniform results have not heretofore been obtained.

With the reactors of the invention a uniform structure is had and uniform results are obtained. The space between the center leg 11 and the keeper 12 is dependent on the depth of the depression 22 and the latter is accurately controlled by the die 19. In its operation, and as an incident thereto, the die smooths any burs or the like on the surfaces 24 of the keeper so that such surfaces, in the finished keeper, are smooth and fully contact the ends of the legs 25 and 26 of the body in the assembled reactor. The depression 22 being made by means of a die it will be the same in each keeper and is inexpensively made. It will be understood that the invention is not limited to impedance devices including bodies of E laminations.

Having thus set forth the nature of my invention, what I claim is:

1. In a reactor, a body of E-shaped laminations the legs of which are of equal length and each provided with a flat free end, a coil about the center leg of said body, a laminated keeper on said body and having end portions directly against the free ends of the outer legs of the body, and said keeper in its intermediate portion opposite the center leg of the body pro-

vided with a flat bottom recess of a predetermined depth whereby such portion is spaced a predetermined distance from the free end of the center leg of the body to determine the impedance of the reactor.

2. The method of making reactors of uniform impedance comprising assembling a body of E-shaped laminations the legs of which are of equal length and each provided with a flat free end, assembling an independent keeper of bar-like laminations, off-setting the intermediate portion of the keeper in the plane of the laminations thereof to provide a flat bottomed depression in an edge of said keeper intermediate the ends thereof without substantial change in the cross-sectional area and configuration of the keeper, and assembling the keeper on the body with said depression facing and aligned with the free end of the center leg of the body and with the end portions of the keeper beyond said depression in direct contact with the free ends of the outside legs of the body.

3. The method of making reactors of uniform impedance comprising assembling a body of E-shaped laminations the legs of which are of equal length and each provided with a flat free end, assembling an independent keeper of bar-like laminations, off-setting the intermediate portion of the keeper in the plane of the laminations thereof to provide a flat bottomed depression in an edge of said keeper intermediate the end portions thereof without substantial change in the cross-sectional area and configuration of the keeper through the use of a die, simultaneously with the forming of said depression bringing the die against the portions of the keeper beyond the ends of such depression to smooth such portions of the keeper, and assembling the keeper on the body with said depression facing and aligned with the center leg of the body and with the smooth end portions of the keeper beyond said depression in direct contact with the free ends of the outer legs of the body.

4. The method of making reactors of uniform impedance comprising assembling a body of E-shaped laminations the legs of which are of equal length and each provided with a free flat end, assembling an independent keeper of bar-like laminations, forming a flat bottomed depression in an edge portion of the keeper, and assembling the keeper on the body with said depression facing and aligned with the free end of the center leg of the body and with the end portions of the keeper beyond said depression in direct contact with the free ends of the outer legs of the body.

5. A reactor including a laminated keeper of substantially uniform cross-sectional area and configuration throughout its length having a recess formed in an edge thereof a predetermined distance to determine the impedance of the reactor.

6. A multi part reactor in which one of the parts comprises a stack of laminations of substantially uniform cross-sectional area and configuration throughout their length recessed in an edge a predetermined distance to determine the impedance factor of the reactor.

7. The method of making reactors of uniform impedance comprising assembling a stack of laminations to form a reactor part, and off-setting the intermediate portion of said part in the planes of the laminations thereof to provide in one edge thereof a depression of a predeter-

mined depth without substantially changing the cross-sectional area of the part, and assembling said part with other reactor parts to form a complete device with the depth of such depression determining the impedance factor of the reactor.

8. The method of making reactors of uniform impedance comprising pressing similar depressions in the edges of laminations without sub-

stantially changing the cross-sectional areas and configurations of said laminations, assembling the laminations into a stack comprising a reactor part with the depressions of the individual laminations in alignment, and then assembling such part with other reactor parts to form a complete device with the depth of such depressions determining the impedance of the reactor.

EDWIN G. GAYNOR.