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3,516,804

COINAGE MATERIAL

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2 Claims

ABSTRACT OF THE DISCLOSURE

Directed to special coinage materials comprising copper alloys containing controlled amounts of alloying elements providing in the materials a density-resistivity-permeability factor similar to that of standard silver alloy coinage material.

The present application is a division of our copending U.S. application Ser. No. 453,570 filed May 4, 1965, now U.S. Pat. No. 3,407,050.

The present invention is directed to a special nickel-containing coinage material and, more particularly, to coinage strip and coins which are interchangeable with current silver coins in sophisticated coin-discriminating devices employed in coin-operated vending machines and the like.

Silver has played a most significant role in the history of coinage alloys and has been the major constituent in United States coins in denominations of \$1.00 or less since the establishment of the U.S. Mint. Silver alloys such as those currently employed in U.S. ten cent, twenty-five cent, half dollar and dollar coins are eminently satisfactory from many standpoints. By long tradition, these silver coins, which contain about 90% silver and the balance copper, have deservedly gained acceptance by the public. These coins are bright and attractive in appearance and have substantial value. In addition, since the character of U.S. coinage has not changed over a long period of years, the vending machine industry has been able through a long course of experimentation to develop coin-discriminating devices built into coin-operated vending machines which can discriminate at a high degree of accuracy between legitimate silver coins and spurious or counterfeit coins. Such coin-operated vending machines are employed on an extremely wide scale for the purpose of dispensing a wide variety of commercial products, including beverages, food, cigarettes, soft goods, etc., coin-operated amusement machines such as phonographs, etc., coin-operated service machines such as washers, dryers, dry cleaning machines, toll booths, etc. The widespread adoption of coin-operated devices of all types has resulted in an ever increasing demand for coins with the result that the U.S. Mint is now producing coins at the highest rate in history. Despite the best efforts of the Mint, there has been nationwide evidence of a coin storage which many experts attribute at least in part to the ever increasing use of coin-operated devices of all types.

A further complicating factor affecting present day silver coinage resides in the fact that due to an ever increasing industrial consumption of silver, the demand for silver now has reached an annual level which far exceeds the annual level of silver production. This factor has naturally forced a continual upward revision of market prices for silver until at the preset time the market price

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is almost at the "melting point" with regard to silver coinage, i.e., the value of the silver content in U.S. silver coinage has now almost reached the point where it would become profitable to melt down the coins for sale as bullion. In order to prevent the price of silver from exceeding the melting point, the Treasury has been releasing to the market silver which has been accumulated by the Government over a period of many years. However, between the factor of the greatly increased demand for silver in coinage and the greatly increased industrial demand for silver, many experts predict that the Treasury's supply of silver will be exhausted in a very short time if it is continually released to the market for the purpose of controlling the price of silver.

The harsh economic facts of the situation have now forced consideration of a substitute material for the silver alloy currently employed in coinage. As a matter of fact, other countries in the world have already discontinued the use of silver in coinage.

The problem of providing a new coinage material for use in place of currently used silver alloys is complicated by many factors, including the factor of public acceptance of and confidence in any new coinage material. The problem is further complicated by the fact that adoption of a new coinage material in place of currently circulating silver coins could require expenditure of very considerable sums of money if the new coinage material were not interchangeable in coin-operated devices with the current silver coinage. However, the problem of providing a new coinage material which would be interchangeable with and equally acceptable by coin-discriminating devices built into coin-operated vending machines is a very complicated one because the existing coin-operated vending machines (which are estimated to be many million in number) are designed to accept the current coinage. Legitimate coins are made to U.S. Mint standards of diameter, thickness, and weight. The metal alloys of legitimate coins, and, of course, other coins, as well, have certain measurable qualities such as electrical conductivity, electrical resistivity, thermoelectric generative qualities, magnetic or nonmagnetic qualities, specific gravity, and hardness or elasticity. These various attributes of coins and slugs form the basis for the various comparative tests which a slug rejector or coin discriminator performs as the coin or slug passes through it to separate slugs and spurious coins from legitimate coins. These tests are performed almost instantaneously. The greater the number of attributes which can be compared and tested, the greater the degree and accuracy of separation.

Not all devices test all attributes. The degree of separation is usually dependent upon the value of the merchandise being dispensed by or obtained from the machine and/or the likelihood of having the machine's change box emptied of legitimate coins by the repeated use of slugs. Many devices merely test for size and weight, but there are increasing numbers of considerably more sophisticated devices that are capable of rejecting essentially all spurious coins, regardless of nearness in size or weight to legitimate coins.

When a coin is deposited in one of the more selective units, it falls first into a two legged, pivoted, delicately balanced cradle which tests the coin for proper diameter and weight. If the coin is too large in diameter, it is stopped between the legs of the cradle and a diameter check-point or boss positioned near the cradle, and it will not continue through the slug rejector. It must be scavenged or swept out by a metal sweep called a wiper blade which is actuated by depressing the coin return lever. On the other hand, if the coin is undersized in diameter, it falls through the legs of the cradle and passes out of the

reject opening at the bottom of the rejector. If the coin is the proper size, it comes to rest momentarily between the legs of the cradle, which are precisely spaced to perform this diameter test.

If the coin passes the diameter test, it is next tested for weight. If it is of proper weight (or greater than proper weight), the cradle rotates on its pivot and the coin is deposited on an inclined plane or rail placed precisely in relation to the cradle, down which it travels by force of gravity. If the coin is too light (e.g., a plastic or aluminum disc), the cradle will not rotate, and the coin remains in the cradle from which it must be scavenged.

The speed of each coin as it travels down the rail is determined by the weight of the coin and the length and slope of the rail. If the coin is of proper weight, it travels down the rail at a proper speed. If the coin is too heavy or too light, its speed down the rail is either too fast or too slow. This becomes critical as the coin reaches the end of the rail, for its speed and weight determine its momentum as it passes through a magnetic field at the end of the rail. The purpose of the magnetic field is to test the coin for metallic composition.

The magnetic field is generated by a permanent magnet precisely located at the end of the rail and facing either a steel, magnetic main plate or, in rejectors in which the main plate is made of nonmagnetic die-cast material, a magnetic disc or keeper.

If a coin is of proper diameter, weight, and thickness, it reaches the magnetic field. Legitimate silver-copper alloy coins are nonmagnetic; therefore, they will not be stopped by the magnet, as also will occur with slugs made of other nonmagnetic alloys. However, slugs made of iron alloys which are magnetic will adhere to the face of the magnet and must be scavenged or wiped off by the wiper blade, which is operated by the coin return lever.

Most coins and slugs, however, are nonmagnetic, yet are affected by passing through the magnetic field. When such coins or slugs pass through the magnetic field, a natural phenomenon occurs, eddy currents (electrical energy) are generated in the coin or slug by the cutting of the magnetic lines of force as the rolling electrical conductor (the coin) passes through the magnetic field. The amount of these currents is determined by the electrical resistivity/conductivity characteristics of the particular alloy of the coin. These eddy currents generate a secondary magnetic field surrounding the coin which field is opposite in direction to that of the field produced by the permanent magnet of the rejector. This opposing magnetic field retards the speed of the coin or slug as it rolls down the ramp or rail. Its speed and, hence, its momentum has been affected; consequently, the trajectory of the coin as it leaves the end of the ramp, which is determined by its momentum, is affected.

The separation of the coin or slug in the device is dependent upon its arc or trajectory on leaving the ramp. The path taken by silver coins involves two obstacles, the deflector and separator. The legitimate silver coin leaves the ramp in a trajectory which avoids the deflector and strikes the separator off center so that it passes down and out the legitimate coin opening. If the coin generates a lesser quantity of eddy currents and a correspondingly smaller opposing magnetic field surrounding it (e.g., brass, lead, zinc or German silver), there will be less retarding force, and the coin will have too long a trajectory (too "fast") and thus strike the deflector and be rejected. If, on the other hand, the coin generates a greater quantity of eddy currents, and a correspondingly larger opposing magnetic field surrounding it (e.g., pure copper), there will be a greater retarding force, and the coin's trajectory will be too short (too "slow") and strike the separator on the wrong side of center, and be rejected.

Rejector devices are fitted to permit adjustments of the positions of the deflector and separator by installation and/or service personnel. These adjustments are pro-

vided to compensate for manufacturing variations in the dimensions and tolerances of the mechanical components and to allow for machine wear. The adjustments are recommended to be made empirically using genuine silver coins and slugs of various materials. The deflector is usually set far enough inward to reject zinc slugs (which have slightly more electrical resistance than silver coins) and yet accept worn silver coins. The separator is set to reject copper slugs (which have slightly less electrical resistance than silver coins) and yet accept brand new silver coins.

It is obvious that the rejector mechanism is an ingenious, unique and complex coin sorting device which has reached an advanced state of development providing a high degree of accuracy and predictability through decades of research and experimentation. The designer of these machines has as his one and ultimate goal to build into the mechanism as foolproof a system as is physically possible to accept the 90% silver-10% copper coinage alloy and to reject coins and slugs of all other alloys and materials.

The excellent electrical conductivity of silver is well known. Only a few metals have similar conductivity. These are copper, aluminum and gold. The 90-10 silver-copper coinage alloy has an electrical resistivity of about 2.1 microhm centimeter (compared with that of about 1.70 for pure copper and 1.63 for pure silver; gold and aluminum are 2.44 and 2.83, respectively). Considering the conductivity/resistivity characteristics alone, pure aluminum or gold coins probably would generate essentially the same amount of eddy current at the same ramp speed through the magnetic field described previously. However, the low density of aluminum would produce less rotational momentum and lower speed and cause rejection. Furthermore, an aluminum coin would be rejected in the earlier stages of the rejector device because of insufficient weight, and its low corrosion resistance, poor ring and low intrinsic value and appeal would preclude it from consideration. Gold U.S. coins have not been minted since the country left the gold standard. In practically every case, alloying a pure metal with another increases resistivity. Silver-copper alloys are unique in that their resistivity is relatively constant over a range of variation in alloy content.

Thus, it becomes apparent that the principal criterion for slug rejection in the devices discussed, that of sorting the legitimate silver coins from other alloys on electrical resistivity considerations, is unique for the silver-copper alloy. Despite painstaking attempts to reproduce the U.S. Mint dimensions accurately, practically all coins except legitimate ones would be rejected by a properly adjusted unit of the type discussed earlier.

There is little question that a device operating on the principles described hereinbefore could be produced which would effectively sort out legitimate coins of a number of alloys suitable in other respects for coinage use. However, one of the major problems confronting the government in selecting a replacement alloy for silver coinage is to find an alloy or material which will operate and be separated in existing slug rejectors interchangeably, and with an equal degree of selectivity from all other slugs, with the 90-10 silver-copper alloy. The interchangeability characteristic is essential during the period of transition from one coinage material to another while both types of coinage are in circulation. The purpose of this invention is to provide such a material.

We have now discovered a new coinage material having highly satisfactory coinage characteristics which is interchangeable in sophisticated coin-discriminating devices with the current silver coinage.

It is an object of the present invention to provide a special nickel-containing coinage material which is interchangeable in coin-discriminating devices with silver coinage.

It is a further object of the present invention to provide a composite coin having a combination of good silvery appearance, wear resistance, tarnish resistance, good coinability and interchangeability in coin-discriminating devices with current silver coinage.

Other objects and advantages of the invention will become apparent from the following description.

Broadly stated, the invention comprises a laminated or layered composite coinage strip or coin having the laminations or layers thereof parallel to the major strip or coin faces with at least one layer being made of copper and with the surface layers being made of a white, non-magnetic nickel alloy and with the respective layers being proportioned in thickness such that the density (D), the resistivity (R), and the permeability (μ) according to the formula DR/μ^2 is equal to about 17 to about 27 gram microhm centimeters per cubic centimeter.

An advantageous combination of materials for the production of the composite coin comprises an inner or center layer of high conductivity copper having a resistivity (R) of about 1.67 but not exceeding about 2.0 microhm centimeters and a density (D) of about 8.9 grams per cubic centimeter comprising about 25% to about 90% of the coin thickness with outer layers of a white, nonmagnetic nickel alloy having a resistivity (R) of about 25 to about 120 microhm centimeters and a density (D) of about 8.55 to about 8.94 grams per cubic centimeter to comprise the remainder of the coin thickness. Advantageously, the outer layers have substantially equal thickness. Examples of such satisfactory nickel alloys, with their physical properties are given in the following table:

Alloy No.:	Percent Ni	Percent Cu	Percent Cr	Percent Si	Percent Zn	Percent Fe	D, grams per cubic centimeter	R, microhm centimeters
1	30	70					8.9	32
2	50	50					8.9	50
3	95			5			8.55	38
4	90		10				8.75	67
5	18	55-65			17-27		8.7-8.73	29-31
6	8-10		17-20			(1)	7.8-7.95	79

¹ Balance.

High conductivity copper and nickel alloys such as those shown in the foregoing table have a permeability (μ) of about 1. As those skilled in the art know, permeability is a dimensionless factor.

Most advantageously, the composite coin produced in accordance with the invention is produced with a central or core layer of high conductivity copper comprising about 52% to about 87% of the coin thickness and with the balance of the coin thickness comprising two outer layers of equal thickness made of an alloy containing about 50% to about 70% copper and the balance essentially nickel. Such alloys have Curie temperatures well below 0° F. This advantageous coin is interchangeable in current vending machine coin-discriminating devices without adjustment thereof when produced in sizes and weights equivalent to U.S. ten cent, twenty-five cent, fifty cent and one dollar coins made of the present silver-copper coinage alloy compositions. Such coins have an attractive appearance and are resistant to corrosion and wear, thus providing a long service life. Furthermore, scrap developed during production of the composite coins can readily be remelted and employed as a portion of the melting stock used to make the nickel-copper alloy, thus providing another important economic advantage for this special coinage material. This important advantage is also obtained in conjunction with composite coinage materials having surface layers of nickel silver, an alloy containing about 18% nickel, about 55% to 65% copper and about 17% to about 27% zinc, but is not obtained when nickel-chromium alloy, nickel-silicon alloy and stainless steel facing materials are employed in the composite. This advantageous composite coinage material is readily produced by methods such as pack-rolling, casting

of composite ingots which are hot rolled and cold rolled to strip, etc. In particular, it is found that a good metallurgical bond is readily obtained between the copper and copper-nickel alloy layers. One means of securing the metallurgical bond between the respective metals is to utilize the heat and pressure developed during hot rolling of the metals together in a pack, for examples at temperatures of about 1100° or 1200° F. to about 1700° F., e.g., about 1450° F. In addition, it is found that the stiffness of the copper-nickel alloy at roll bonding temperatures is not significantly different than the stiffness of high conductivity copper. This factor, and the fact that the copper-nickel alloy does not form an adherent oxide under roll bonding conditions, provides for this combination of metals particularly advantageous practical advantages. Other means for securing a metallurgical bond between the several metal layers, e.g., brazing, explosive bonding, cold roll bonding, sintering, etc., may be employed in fabricating the composite coinage strip. The composite coinage strip, rolled to the requisite thickness, is readily blanked, edge rolled and embossed to coins using the equipment and procedures employed for the production of silver alloy coins from strip. A most advantageous coinage strip and coin comprises 55% thickness high conductivity copper core and a 70-30 cupronickel cladding. Such a coinage material offers long life in service while maintaining interchangeability with silver alloy coinage even after being subjected to wear, corrosion and resultant loss of weight in service.

In the composite coinage materials contemplated in accordance with the invention, the thickness fraction of the high conductivity metal, e.g., copper or copper alloy

portion or portions is correlated to the total thickness of the coin according to the following relationship:

$$f_{Cu} = \frac{A\mu^2 R_{Cu} - R_{Cu} R_{Ni} D_{Ni}}{R_{Cu} R_{Ni} (D_{Cu} - D_{Ni}) - A\mu^2 (R_{Ni} - R_{Cu})}$$

where:

f_{Cu} = the fraction of the coin volume comprised by the copper core

A = A density-resistivity-permeability factor between 17 and 27 gram microhm centimeters per cubic centimeter

μ = The permeability of the coin

R_{Cu} = The resistivity of the copper layer

R_{Ni} = The resistivity of said nickel alloy

D_{Cu} = The density of said copper layer

D_{Ni} = The density of said nickel alloy

In accordance with another satisfactory embodiment of the invention, the permeability factor of the coin as expressed in the relationship DR/μ^2 is increased by including within the composite a centrally located layer comprising not more than 1% of the coin thickness made of an alloy having high magnetic permeability. Suitable alloys for this purpose are readily saturated magnetically at magnet field strengths of about 500 gauss and have a magnetic permeability of about 10,000 to about 800,000. Alloys sold commercially as Permalloy and containing about 11% to about 21.5% iron, up to about 5% molybdenum, up to about 14% copper, up to about 1% manganese, up to about 4% chromium, and about 72% to 79% nickel are satisfactory. Soft magnetic alloys which are hot-workable and cold-workable and which may be

employed for the high permeability alloy layer are set forth in the following table:

Alloy No.	Percent Ni	Percent Fe	Percent Cr	Percent Cu	Percent Mo	Percent Mn
7	78.5	21.5				
8	78.5	17.7	3.8			
9	78.5	17.7			3.8	
10	77.4	13.3		5	3.7	
11	75	16-18	2-4	5		
12	72	11		14	3	
13	70	15			5	0.5
14	Bal.	16			5	

In general, any soft magnetic, hot-workable and cold-workable alloy having a base of iron, cobalt or nickel could be used. When such a centrally located high permeability metal layer is employed within the copper inner layer or core, the total copper thickness is reduced to about one-third of the total coinage strip or coin thickness and the total nickel-copper alloy thickness is increased and the resulting coin has the advantage that a smaller central red copper rim is exposed at the edge of the coin and the coin would be less readily counterfeited using the proportions of copper visible at the edge. When the layer of high permeability alloy having a thickness not exceeding 1% of the thickness of the coin is employed, an enhanced slowing or retarding effect is produced as the coin passes the magnetic gate in the final acceptance testing step employed in conventional coin-discriminating devices without causing actual frictional contact with the magnet. In this way, a special control of coin acceptance is achieved without encountering variable effects which would be the case if magnet-coin contact were induced. It will be appreciated that when a central or core layer of high magnetic permeability metal is employed, the resulting coinage strip or coin will have five or more layers in all since the coinage strip or coin in all cases should be symmetrical about the longitudinal axis. This factor introduces a practical production disadvantage as compare dto the copper-cored composite in which only a total of three layers is required.

In most instances it is found advantageous to employ a copper inner layer material composed of a high conductivity copper. Thus, electrolytic tough pitch (ETP) copper, silver-bearing copper containing up to 30 ounces per ton of silver, or oxygen-free (OF) copper, are employed with advantage. Thus, when a copper of high conductivity, i.e., a copper having a resistivity of about 1.67 to about 1.71 microhm centimeters is employed in the composite coinage material, it then becomes possible to maximize the thickness of the facing metal layers. This latter factor is a positive advantage since the thus-produced coins have maximum longevity in service while maintaining interchangeability in coin-discriminating devices with silver alloy coinage even to the point at which the coins become almost illegible due to wearing away of the surface layers. In some cases it is possible to alloy the copper with minor amounts of a metal such as nickel, aluminum, zinc or manganese to increase the hot hardness of the copper and/or to facilitate bonding of the resulting alloyed copper to the white nickel alloy facing layers. Nickel may be employed in amounts up to about 1%, zinc in amounts up to about 1.5%, manganese in amounts up to about 1% and aluminum in amounts up to about 0.2% for this purpose. Such alloying increases the resistivity of the copper, and when such a practice is adopted the thickness of the nickel alloy facing layers must be reduced in accordance with the relationship set forth hereinbefore in order for the coin to have a density-resistivity product in the range of 17 to 27 gram microhm centimeters per cubic centimeter. In fact, it is possible to produce a solid copper alloy coin having a resistivity not exceeding 3.04 microhm centimeters containing small amounts of a metal such as nickel, aluminum, zinc, tin or manganese which will have a density-resistivity product of 17 to 27 gram microhm centimeters per cubic

centimeter and will have interchangeability with silver alloy coinage in coin-discriminating devices. For this purpose, nickel may be employed in amounts up to about 3%, e.g., about 0.5% to 3%, zinc in amounts up to about 3.5%, e.g., about 2% to 3.5%, aluminum in amounts up to about 0.5%, e.g., about 0.1% to about 0.5%, preferably about 0.3%, and manganese in amounts up to about 3%, e.g. about 0.5% to about 3%. A copper alloy containing about 0.7% tin may be employed. Nickel, zinc, and manganese are advantageously employed because the resistivity of the copper alloy coinage materials produced through the use of these elements individually can readily be controlled in practice. Aluminum and tin are less advantageous in this regard. The residual deoxidizer contents in the alloys should be carefully controlled since even small contents of elements such as silicon and phosphorus strongly affect the resistivity of copper. Such solid copper alloy coins lack the bright silvery color of laminated coins produced in accordance with the invention, but, to the contrary, are characterized by an undesirable reddish color and by susceptibility to tarnishing in service. Examples of such copper alloys and the density-resistivity products obtained from wrought coin-size discs made therefrom are set forth in the following table:

Alloy No.:	Composition	Density-resistivity product, gram microhm-centimeter per cubic centimeter
A	0.52% Ni, balance Cu...	19.11
B	1.61% Ni, balance Cu...	19.76
C	2.60% Ni, balance Cu...	22.67
D	3.00% Ni, balance Cu...	26.99
E	2.86% Zn, balance Cu...	19.03
F	3.48% Zn, balance Cu...	21.67
G	0.7% Mn, balance Cu...	17.20

In order to give those skilled in the art a better understanding of the invention, the following illustrative examples are given:

EXAMPLE I

A composite slab was made by welding together a plate of high conductivity oxygen-free copper about 0.125 inch thick having on each side thereof cover plates 0.055 inch thick made of an alloy containing about 70% copper and about 30% nickel. A small vent hole about 1/32 inch in diameter was drilled through one cover plate near the end. The welded assembly was annealed in dry hydrogen gas at a temperature of 1112° F. for one half hour. In this manner, volatile substances were removed from the assembly. The vent hole was plugged with magnesia and the assembly was then heated in an air atmosphere to 1450° F. The heated assembly was then hot rolled to a total thickness of about 0.125 inch with the reduction in the first pass being 25%. It was found that at this point the composite slab was completely bonded. The surfaces of the roll bonded assembly were buffed to remove oxide scale. Portions of the roll bonded assembly were cold rolled to coinage strip thicknesses appropriate for the production of coins having the dimensions of U.S. ten cent, twenty-five cent, and fifty cent coins. Coin-size blanks were punched from the resulting cold rolled strip. The blanks were edge rolled and embossed at 60 tons embossing pressure to produce test coins. It was found that test coins produced in this manner were accepted in standard coin-discriminating devices without alteration thereof in ten cent, twenty-five cent and fifty cent coin sizes in the same manner as legitimate U.S. silver alloy coins.

EXAMPLE II

A five-layer slab was prepared by welding together two high conductivity oxygen-free copper plates 0.125 inch thick to outer plates 0.200 inch thick made of an alloy containing about 70% copper and 30% nickel and to a central layer of 0.006 inch thick sheet made of a high permeability alloy containing about 16% iron, about

5% molybdenum and the balance essentially nickel. Each piece in the composite slab was cleaned beforehand by belt sanding. Again, a small vent hole about $\frac{1}{32}$ inch in diameter was drilled through one cover plate at the end of the assembly. The welded assembly was bonded by heating at 1112° F. in hydrogen. The vent hole was plugged with magnesia and the assembly was reheated to 1450° F. and rolled to 0.400 inch thick in one pass. In this manner, a complete bonding of the assembly was achieved. The assembly was again heated to 1450° F. and hot rolled to 0.125 inch thick. The resulting hot rolled strip was cold rolled to appropriate gage for punching, edge rolling and embossing of test coins having the dimensions of the standard U.S. twenty-five cent coin. Test coins were produced by punching coin blanks from the composite, edge rolling the blanks and embossing the blanks at 60 tons pressure. The resulting test coins were accepted interchangeably with standard silver alloy coinage in a conventional coin-discriminating device without adjustment thereof.

The composite coin of the invention can, if desired, display the red copper color as a narrow band about the periphery thereof. This characteristic affords a distinctive appearance to the coin. If desired, the coin blanks having cupronickel or nickel silver facing layers can be controllably machined to remove a portion of the copper rim without attacking the white nickel alloy facings. In the case of composite coin blanks produced with facing layer alloys containing 10% or more of chromium, the coin blanks can be controllably etched in a nitric acid solution to achieve the same result. When such blanks are subsequently edge rolled and embossed, the white nickel alloy is folded over the space from which the copper was removed and the coin presents a periphery made entirely of the white nickel facing alloy.

Although the present invention has been described in conjunction with preferred embodiments, it is to be understood that modifications and variations may be resorted to without departing from the spirit and scope of the invention, as those skilled in the art will readily understand. Such modifications and variations are con-

sidered to be within the purview and scope of the invention and appended claims.

We claim:

1. As a new article of manufacture, a wrought coin-size disc suitable for use in coin operated vending machines made of a copper-base alloy having a density resistivity-permeability factor of about 17 to about 27 gram microhm centimeters per cubic centimeter, said alloy consisting of about 0.5% to about 3% Ni and the balance copper.
2. As a new article of manufacture, a wrought coin-size disc suitable for use in coin operated vending machines made of a copper base alloy having a density-resistivity-permeability factor of about 17 to about 27 gram microhm centimeters per cubic centimeter, said alloy consisting of about 2% to about 3.5% Zn, and the balance copper.

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