L. W. DOWNES & R. C. PATTON.

MAGNETIC CHUCK.

APPLICATION FILED JUNE 29, 1916.

1,232,512.

Patented July 10, 1917.

2 SHEETS—SHEET 1.

Fig. 1

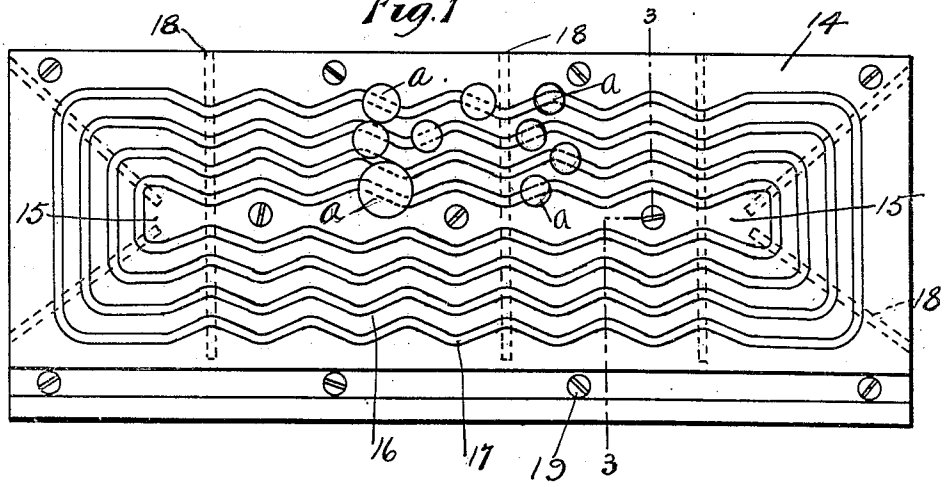
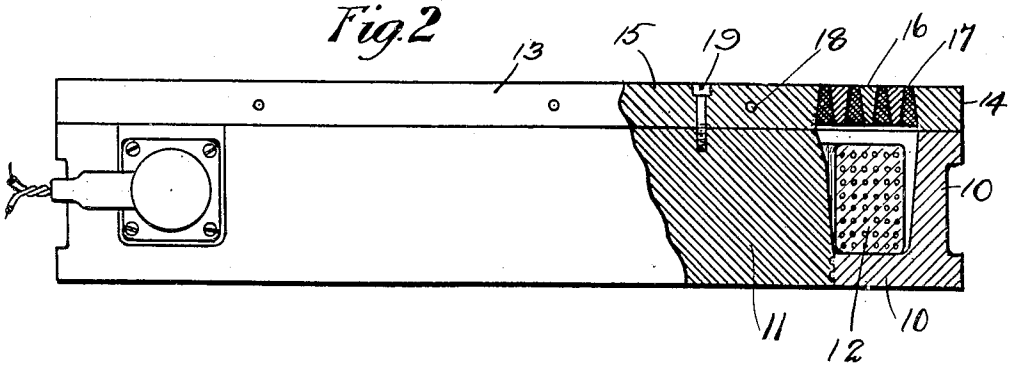


Fig. 2



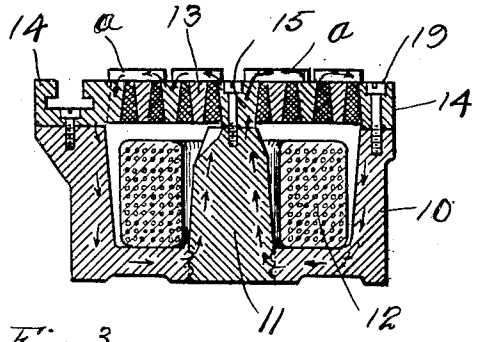


Fig. 3

Witnesses

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Fig. 4

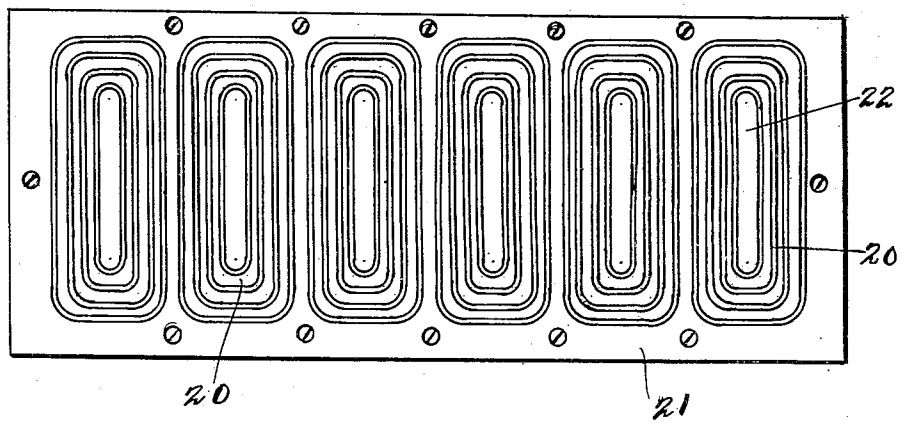


Fig. 5

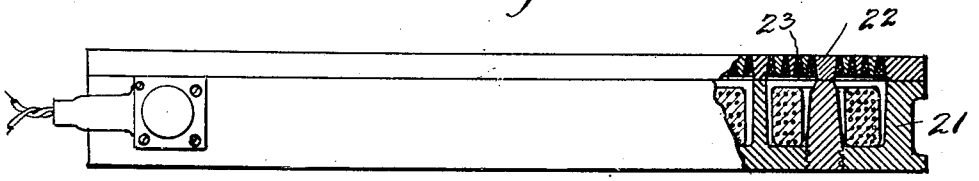
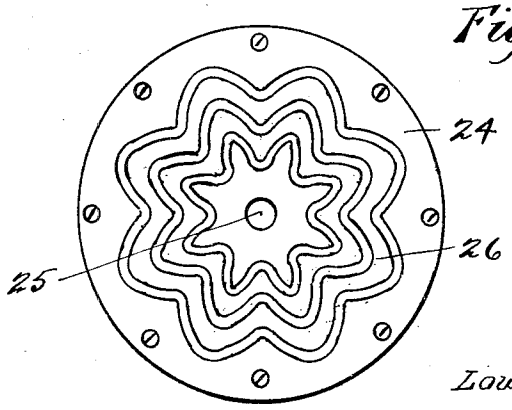


Fig. 6



Witnesses

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UNITED STATES PATENT OFFICE.

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MAGNETIC CHUCK.

1,232,512. Specification of Letters Patent. Patented July 10, 1917.

Application filed June 29, 1916. Serial No. 106,579.

To all whom it may concern:

Be it known that we, LOUIS W. DOWNES and RALPH CLIFTON PATTON, citizens of the United States, and residents of Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Magnetic Chucks, of which the following is a specification.

This invention relates to magnetic chucks or holding devices more particularly adapted for holding small pieces of work to be operated upon, but the same is adapted for holding work of any form.

The primary object of this invention is to provide such a chuck or holding device, with a face plate having a plurality of alternate flux carrying members and non-magnetic gaps between its center pole and its outer flux carrying frame, whereby the undesirable leakage of magnetic flux present in all other types of this class of chucks which results in a loss of holding power, is here reduced to the very minimum.

A further object of the invention is the forming of the face plate separate from the body portion and removably securing the same thereto.

A still further object of the invention is the provision of a chuck formed of a plurality of magnetic units assembled in a single inclosing flux conducting frame to operate in conjunction with each other upon the work.

With these and other objects in view, the invention consists of certain novel features of construction, as will be more fully described, and particularly pointed out in the appended claims.

In the accompanying drawings:

Figure 1— is a plan view showing the face of the chuck and the arrangement of the alternate flux carrying members and magnetic insulations separating the center pole from the outer frame or other pole.

Fig. 2— is a side elevation partly in section illustrating the construction whereby the face plate is formed separate and subsequently secured to the body of the chuck.

Fig. 3— is a sectional view on line 3—3 of Fig. 1.

Fig. 4— is a top view showing a chuck formed of a plurality of magnetic units assembled together in a single flux carrying frame.

Fig. 5— is a side elevation of the chuck shown in Fig. 4 partly in section.

Fig. 6— is a face view of a chuck member made in a circular form and having a plurality of alternate magnetic insulations and sinuous flux carrying members separating its center pole from its outer frame or pole.

Referring to the drawings, 10 designates the body portion constructed in the form of a trough-shaped receptacle and formed of magnetic flux carrying material such as cast iron or the like. In the middle portion of this body is formed a core 11 of different material such as wrought iron or the like for the purpose of increasing the magnetic influence or action of the chuck upon the work. This central core is preferably connected to the base of the body portion by being cast therein.

A suitable magnetic wire coil 12 is carried in this frame 10 and is laid about this central core 11.

A feature of our improved chuck is in the construction of the face plate 13. This plate is preferably formed separate and independent of the body portion of the chuck, and comprises essentially an outer frame member 14, a central pole member 15 and a plurality of intermediate independent nesting magnetic flux conducting frames or rings 16 spaced apart and set one within and perfectly parallel with the other, and the spaces between these frames are filled with non-magnetic material such as lead, Babbitt metal or other suitable substance.

A plurality of pins 18 of low magnetic permeability such as nickel steel, bronze or other suitable material, are passed through from the outer frame inward through all of the intermediate frames and insulations into the center pole member 15, whereby all of these members are rigidly locked together to prevent them from being forced out of position, even if a piece of heavy work should be accidentally dropped upon the face of the chuck. After this face plate has been so formed and finished on its top and bottom surfaces, it is secured to the body portion by screws 19 or other suitable means, and the center pole 15 then comes in contact with the core 11 of the body portion, and

the outer frame 14 with the corresponding portion 10 of the body member.

By this construction, it will be noted that by the provision of a plurality of non-magnetic gaps arranged in series magnetically the desirable flux leakage between the central pole and the outer flux carrying frame is reduced to the minimum. When the work which is frequently in small pieces, is distributed about the face of the chuck in such a manner as to bridge the gaps, the magnetic flux travels upward through the core 11, central pole 15, across the work *a* as it bridges the gaps, into the different intermediate frames and then down through the outer wall of the body portion as best illustrated by the arrows in Fig. 3.

When work is placed on the chuck in such a way that a portion only of the entire number of gaps are bridged, then the total flux will traverse this work and the reluctance of the magnetic circuit is lessened in proportion to the number of non-magnetic gaps so bridged.

When no work is on the chuck face, the total amount of leakage must be across the several gaps in series.

It is found in practice in some instances, particularly where the intermediate frames are straight, that narrow straight bars of the same or less width than the frames placed upon the chuck to be operated upon, would not be held firmly as the work must bridge one or more of the gaps to be affected by the magnetism.

In order to obviate this difficulty, we have formed these frames so that portions of them are sinuous or arranged to follow a zigzag course as illustrated in Fig. 1 thereby rendering the chuck capable of operating more effectively upon the work of a greater variety of shapes.

The form of construction illustrated in Figs. 4 and 5 enables us to make chucks of different sizes by the use of but a single set of casting patterns, for the reason that the center poles 22 and intermediate frames 23 are duplicated in the several magnetic units. The patterns for the outer frame 21 may be made in separate sections if desired, and any number of these pattern sections may be used to cast a frame of the desired dimensions to receive the required number of magnetic units. Then again by our construction, it is possible to make a single pattern of the outer frame and face frame, of the largest size and then use this pattern for the smaller sizes by simply "stopping off" that portion not desired, during the molding operation.

It will be seen by this construction that the cost of producing chucks of different sizes may be reduced to the minimum.

The chucks constructed as described above consist of a plurality of magnetic units, each having a coil, center core, nest of face frames and return path for the magnetic flux, which latter consists of the outer inclosing frame. Each unit is magnetically independent of the other although their outer frames may be integrally formed both mechanically and magnetically.

In other instances the chuck may be made in a circular form as illustrated in Fig. 6, in which the outer frame is separated from the center pole 25 by a plurality of rings insulated from each other, and as shown in this figure these rings 26 may be made to follow a sinuous or zigzag course in a general circular direction if desired so that if a piston ring or the like should be applied to the chuck, it could not be placed on its surface in any position without bridging one or more of the non-magnetic gaps.

The face plate of our improved chuck may be constructed very easily and with small expense by first casting all of the various rings or frames in one piece being connected together by a thin web or sheet of metal on one side only (not shown). Such a casting when taken from a mold will be in reality a thick plate with a number of deep grooves on one side into which grooves is poured a soft non-magnetic filling metal or material which is usually employed for filling such magnetic gaps. The plate will then be machined on both sides to secure true surfacing. The connecting web which is used merely for the sake of supporting the ring while being cast will be removed in the surfacing operation thereby leaving the intermediate rings or frames entirely insulated from each other and providing a plurality of alternate flux carrying members and magnetic insulations which separate the center pole from the outer frame thus reducing to the minimum the leakage of magnetic flux. The device is extremely simple, practical and inexpensive in construction and effective in its operation.

We have shown and described one illustrative embodiment of our invention but we desire it to be understood that although specific terms are employed they are used in a generic and descriptive sense and not for the purpose of limitation, the scope of the invention being defined by the appended claims.

We claim:

1. A magnetic chuck comprising a body portion carrying a magnetic coil, an independent removable face plate attached to said body having a central pole and an outer frame, and a plurality of alternate independent flux-carrying frames and non-magnetic portions intermediate said pole and outer frame, and tie bars between said frames supporting them in position.

2. A magnetic chuck comprising a body

portion carrying a magnetic coil, an independent face plate removably attached to said frame, said plate having a central pole and an outer frame and a plurality of independent spaced apart parallel sinuous frames located intermediate said pole and outer frame, non-magnetic portions being interposed between said frames, and independent means for mechanically connecting together said pole and all of said frames.

In testimony whereof we affix our signatures.

LOUIS W. DOWNES.
RALPH CLIFTON PATTON.