May 22, 1951 T. E. BARLOW 2,553,627

WEAR INSERT FOR CORE BOXES

Filed April 8, 1949

FIG. 1

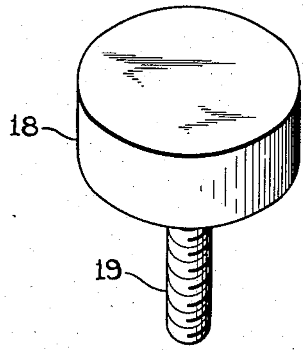


FIG. 2

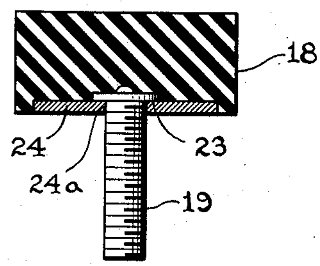


FIG. 3

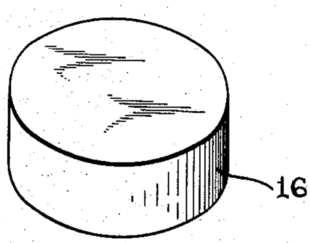


FIG. 4

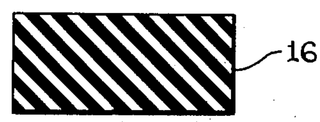


FIG. 5

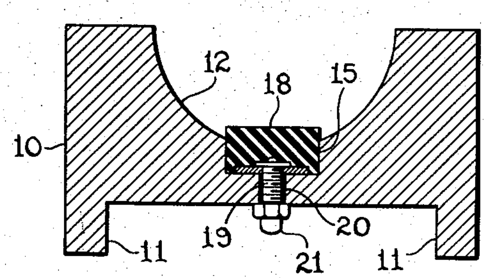


FIG. 6

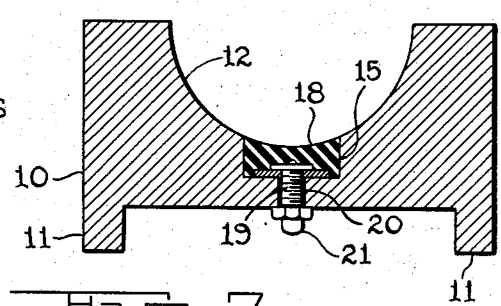


FIG. 7

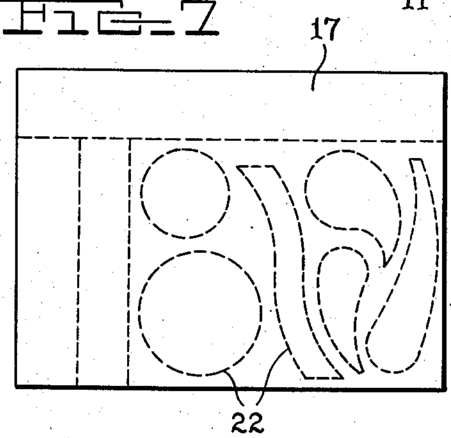
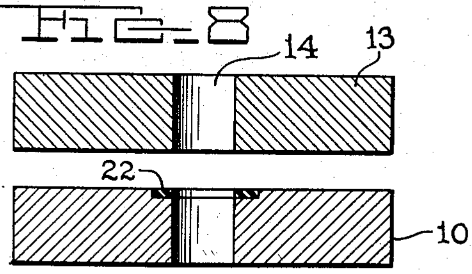


FIG. 8



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Patented May 22, 1951 2,553,627

UNITED STATES PATENT OFFICE

2,553,627

WEAR INSERT FOR CORE BOXES

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Application April 8, 1949, Serial No. 86,299

1 Claim. (Cl. 22—13)

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My invention relates generally to foundry equipment, and more especially to core boxes and the like, and particularly concerns the provision of replaceable inserts displaying long life for those portions of core boxes and similar foundry equipment subjected to rapid, concentrated and localized wear.

An object of my invention is to provide replaceable inserts for core boxes and similar foundry equipment characterized by their extreme simplicity; which inserts display long useful life; a high degree of resistance to attack by core oils and other oils; and which are non-swelling upon exposure to, and are resistant to, both acids and alkalis; which are formed of material which retains its initial high degree of resilience throughout its long, useful life in the absence of detrimental hardening; and which is unaffected by the moderate temperatures prevailing locally during the pouring and tamping of sand in foundry practice.

Another object is to provide wear inserts of the general type described which may be readily and firmly cemented to metal, which are replaceable on the shop floor without necessity of returning the core box to the pattern shop, which appreciably diminish the number of core boxes which are required for a given pattern operation, which minimizes wear of the core box proper in the region of such wear inserts, which require a minimum replacement time and diminishes the periods of lost production, and which involves low cost, both in initial production and installation and in subsequent employment and replacement.

Another object is to provide a wear strip or insert for the open joints of core boxes and similar foundry equipment to insure proper relationship between the core box and the associated blow plate at the open joint therebetween; which wear strip, simple in itself, and of extremely low first cost displays a length of life many times that of wear strips of metal, which may be formed to any desired shape and, thus formed, readily and quickly applied, thereupon providing an effective air seal between the core box and the associated blow plate and which, at the same time, is highly resistant to attack by oil and displays non-swelling qualities upon exposure thereto; which does not disintegrate in use or harden upon ex-

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posure to ordinary temperatures maintaining locally in sand-pouring practice; which is highly resistant to both acid and alkali attack; and which is readily cemented to metal, and this on the foundry floor without necessity of returning the core box to the pattern shop.

All these and many other highly important objects and advantages attend upon the practice of my invention, which in part will be obvious and in part more fully pointed out hereinafter during the course of the following description, taken in the light of the accompanying drawings.

My invention, accordingly, may be seen to reside in the several parts, materials, elements and features of construction, and in the relation and combination of each of the same with one or more of the others, the scope of the application of which will be more fully pointed out during the course of the following description, considered in the light of the accompanying claim.

In the several views of the drawings, wherein like reference characters denote like parts, and wherein I have disclosed those embodiments of my invention which I prefer at present;

Figure 1 is a perspective view of one form of my wear insert employing a metal shank; while

Figure 2 is a vertical longitudinal section therethrough;

Figure 3 is a perspective view of another form of wear insert in which the metal shank is omitted, while

Figure 4 is a longitudinal vertical section therethrough;

Figure 5 shows the wear insert of Figures 1 and 2 as first applied to a core box; while

Figure 6 is a similar view, showing the wear insert as contoured to the shape of the core box;

Figure 7 discloses, in plan, a sheet of plastic material according to the practice of my invention, from which may be cut wear strips of desired shape to a suited problem; while

Figure 8 discloses a wear strip applied to the open joint between a core box and its associated blow plate.

As conducive to a more thorough understanding of my invention, it may be noted at this point that in charging sand into a core box, the sand is blown in under high air pressure, in order that the sand will tamp into position around the pattern. A high degree of wear is observed in those regions of the core box interior where the sand impacts locally, with either undiminished or substantially undiminished force against the metal of the core box.

It was early found that unless some provision were made to compensate for this wear, the core box would quickly have to be discarded in its entirety. This, for the reasons that were the core box to be left in use without repair, the sand would not properly fill the box and, moreover, would shake out, subsequent to use, only with difficulty. Moreover, upon prolonged use under such conditions, the core box would simply fail because of excessive wear of its walls.

While one may drill out the worn portions of the core box to insert therein metal wear strips formed of extremely hard metals, I find that many disadvantages attend upon this practice. For one thing, although extremely hard metals may be employed, nevertheless they display deplorably short life. They then have to be removed, the holes reground, a new wear insert of hard metal turned, and the same inserted in position. For another, when it becomes necessary to insert a new wear insert, this entails a job of "tailoring" the wear insert to the particular recess in which it is to be positioned. In turn, this necessitates the attention of a skilled pattern maker who must remove the core box to the pattern shop, where the repair work is then undertaken.

In addition to localized wear of core boxes at positions immediately underlying the openings in the blow plate, it will readily be appreciated that there are other points of localized wear. Particularly in the region of that surface of the core which contacts the surface of the blow plate, it is observed that through the direct impact of the molding sand, both under the longitudinal and lateral components of impelling force, considerable localized wear is occasioned at certain spots on a core box.

When the spots of localized wear develop, drastic repair is required, this to remove a substantial portion of the core box by a drilling operation. A metal wear strip of extremely hard metal is then inserted in the region of the metal which has been removed. This practice, however, is subject to the many difficulties.

An important object of my invention, therefore, is to correct in large measure the several defects and disadvantages hereinbefore recited, and in so doing to provide wear inserts and wear strips which are nicely contoured to the exact shape of the region of wear, and which may be readily inserted in position on the work floor without removal to the pattern shop; which effectively suppress scattering of the impacting mold sand and thus suppress secondary and tertiary wear conditions; which display long useful life with a high resistance to wear, and this in the substantial absence of swelling and disintegrating in the presence of oil, acid, alkali, and temperature attack; which are non-hardening in use; and which appreciably diminish the number of core boxes which are required for a given high production pattern operation.

Referring now more particularly to the practice of my invention, attention is invited to the several views of the drawings. It will be seen that the core box indicated generally at **10** (Figures 5 and 6) has legs **11** therefor, so that the same is raised above the ground for a purpose hereinafter to be described, and has a central recess on its upper face, shown generally at **12**. It will be understood that within this recess **12** the pattern is provided of varying degrees of complexity of design and that the sand is blown around the pattern between it and the walls of the core. The blow plate **13** (Figure 8) overlies the core box **10**; and through its many blow holes **14** sand is introduced about the pattern into the core box recess **12**.

In its introduction into the core box, the sand impinges directly on many localized points with substantially undiminished velocity. Not only does this condition give rise to a high degree of localized wear at such point of impingement, but, as well, when the sand impacts locally against these metal parts, it scatters in all directions, with force that is still of important dimensions. When this reflecting sand, scattering in all directions, impinges anew upon the core box, it gives rise to a high degree of wear at these reflected points of impingement.

To correct the condition of excessive wear, I drill, ream, or otherwise provide a number of depressions **15** in the core box in the regions of direct impact. I form these depressions of sufficient diameter to include an area which will receive all of the direct impact of the inrushing sand. I make all of these openings of the same diameter. Within the openings I provide a cylindrical disc **16** of a resilient material displaying long useful life, which is non-swelling and resistant to disintegration upon exposure to oil and, as well, is resistant to both acid and alkali attack, is non-hardening in use, is not affected by exposure to the moderate temperatures prevailing locally during the course of the influx of the sand into the mold and which may be readily cemented to the metal.

The material is selected from the Buna rubber family. Particularly, it may have a composition as follows:

	Parts
Perbunan 26 [1] (Standard Oil Enjay)	100.00
Stearic acid	1.00
Zinc oxide	5.00
MPC black [2]	60.00
Dibutyl phthalate	20.00
Altax [3] (R. T. Vanderbilt Company)	0.25
Sulfur	2.00
Safex [4] (Naugatuck Chemical Co.)	1.00

[1] Copolymer of butadiene and acrylonitrile having an acrylonitrile content of approximately 28%.
[2] Medium processing channel black with mean diameter of particles about 28 millimicrons.
[3] Benzothiazyl disulfide.
[4] 2,4-dinitrophenyl dimethyl dithicarbamate.

This material illustratively is cured or vulcanized for about 14 minutes at a temperature of approximately 292° F. until there is imparted thereto a durometer hardness of approximately 60–65 Rex gauge.

In evolving the foregoing composition, I have initially had recourse to rubber materials both of natural and synthetic rubber. These have been unsatisfactory in use for the reasons, amongst others, that not only does the rubber soften and disintegrate in use, probably due to attack from the oil in the core box, but it is incapable of successfully withstanding acid and alkali attack. Various plastics too, such as the vinyl chlorides, were used, these however without the success which was to be anticipated. Although displaying excellent wear-resistant qualities when first applied, it was found that they hardened rapidly in use, possibly because of reaction between oil and the components of the plastics, and the wear-resistance qualities initially displayed were quickly lost. Additionally, these plastics were found to soften and scuff, perhaps from the temperature of the incoming sand and air. It was not until my neoprene composition was employed that successful results were achieved.

Where the round disc 16 of Figure 3 is employed without the use of the metal shank, I form the disc either of material molded and cured as a round disc, or as a disc formed of material supplied in sheet form from which the disc is cut. In either case, the round disc 16 is coated with suitable cement and then inserted into the hole of uniform diameter provided in the core box for the reception of the wear insert. This effectively avoids the necessity of initially inserting a metal wear insert and replacing the same by another insert when the first has become worn, or repairing it by soldering or brazing, work, as pointed out hereinbefore, requiring the services of a skilled craftsman.

In connection with the prior practice, it is my observation that it is not unusual for the repair of a core box to require fifteen hours. Moreover, this work must be repeated within a relatively short space of time. Obviously, this represents a costly loss in production during the time that the core box is out of service. I find the use of my wear buttons and inserts saves time and aids importantly and effectively in eliminating one extra core box per job. To illustrate, on high production items, it is common to have three sets of core boxes in service, in order to avoid shutdown from replacement of the wear inserts and for general repair. I have found that the vastly decreased loss of time in changing my new wear inserts has the effect of eliminating one set of core boxes for the operation. The elimination of one such set of core boxes may save up to several thousand dollars per pattern.

Another advantage of my composition inserts is that they do not have the smooth reflecting surface possessed by metal. When sand impinges on the metal wear insert, part of it is reflected from this polished, unyielding surface and flies off in all directions, thereby causing wear not only from the direct impact on the metal insert, but, as well, due to secondary impact on the metal of the core box itself. It is apparent that repair under such conditions may involve a much higher element of expense than where only the replacement of the insert itself is required. Contrasted with this, when the sand impacts upon my resilient composition, the yield of the latter absorbs the blow of the sand and the latter compacts in place, in the region about the insert, without reflection at high velocity in random direction. Wear around the insert is much reduced.

Not only is the initial cost of my inserts extremely low, but the costs of repairing or replacing the inserts is likewise extremely low for any given replacement, as compared with the use of metal inserts. Additionally, whereas on a production job a metal insert may be found to wear so badly as to require repair within say eight hours, in many instances I have found inserts of my new compositions to endure for as many as three hundred working hours.

Rather than the round disc 16 referred to, the wear inserts of odd or irregular shape disclosed in Figure 7 may be employed. These are cut from a sheet 17 of my composition and cemented in place. I find these highly satisfactory in many applications where irregular impinging surfaces are encountered.

While in many applications an insert may be

cemented to the core box, I generally prefer an insert which is molded to a metal shank for securing it in place. Thus, as illustrated in the drawing (Figures 1 and 2) insert 18 is molded to the metal shank 19. And as has been hereinbefore described, the hole 20 (Figures 5 and 6) is drilled through the core box 10 to receive the shank 19. After the bolt 19 is passed through the box 10, a nut 21 is applied to the shank on the opposite side of the box 10 to secure the insert in place. This makes it a very simple matter to change an insert when worn. It can be done simply and rapidly when such change is required, and the additional advantage is apparent that change is only infrequently required.

In applying the shank 19 to the insert 18 (Figure 2), I provide a head 23 of enlarged section on the shank, and a washer or the like, comprising a metal disc 24 preferably of steel, imbedded flush within the plastic head 18. The bolt consisting of shank 19 and head 23 extends through an opening *24a* in the disc 24, so that the bolt is anchored by head 23 against the disc 24. The head 23 being imbedded in the plastic, the bolt is firmly anchored in position, and upon turning the washer 21 down thereon, the wear button is firmly secured into its intended position.

In inserting my new wear insert discs or buttons, it is desirable, but not absolutely necessary, to proceed according to the following technique: First, a recess 15 of standard diameter is drilled out in the region of the worn spot, for the reception of the insert. The drilled area is thoroughly cleaned with solvent, and is air-dried. Two small holes (not shown) are drilled through the box in the base of the recess to permit the escape of the air which is otherwise trapped in the recess when the button 16 is positioned in the recess 15. Thereupon both the recess and the disc are covered with a thin coating of a cement. It is only necessary to satisfy the prerequisite that since the buttons must yield slightly under the impact of the incoming sand, the selection of the cement must be such that it will display long holding properties under the repeated stressing of the disc. In addition to long life and service, it must be display long storage life, must be easily applied, must not react with the plastic buttons, and must be compatible therewith.

Assuming, therefore, the use of a properly selected cement, it is permitted to dry in place for a few moments until the cement becomes definitely tacky. Such a condition exists when no cement is picked up on the fingers when touched. The button 16 is then pressed into the depression 15 and tapped firmly into position with a mallet. It is then desirable, but not necessary, to apply a clamp or a weight for approximately an hour, at room temperature. The insert then is shaped, carved or scraped to the proper contour, whereupon excess cement is removed from the surface through the use of acetone, toluene, or similar solvent.

The foregoing specific description has been directed in large measure to the wear inserts having the shape of a disc or button of predetermined regular configuration, and of preselected diameter. In the general description, however, reference has been made not only to wear inserts of the general type just hereinbefore specifically described, but, as well, to wear strips of irregular, tailor-made conformation. In this connection, it is to be noted that in the normal handling of core boxes, considerable wear occurs at the joints thereof.

I have discovered that strips 22 (Figure 8) of Buna rubber composition used at the points of wear in the joints, effectively subserve several important and effective purposes. Because of their inherent resilience, they form an effective air seal and block off the escape of sand and air, thus effectively suppressing wear of materials and discomfort to the operator. Because of their ease of application, they are less costly than metal. Because their life is ten to twenty times that of metal, they are initially much cheaper.

Illustratively, the wear strips are cut from sheets 17 of Buna rubber approximately 12″ x 12″ square, and have a standard thickness of say one-eighth of an inch and one-fourth of an inch. In use, it is observed that metal wear strips wear rapidly and must be replaced as required, and that additionally a perfect fit between the core box and the blow plate is seldom possible, so that laterally escaping air and sand quickly causes wear over and above that normally resulting from the direct abrasive impact of the main body of sand on the core box.

In the practice of my invention, the wear strip is cut to size and is cemented into place with plastic cement in the same general manner as hereinbefore described with respect to the wear buttons. In cases where a metal strip is used, my wear strip may be cemented along its length. Or, where desired, the wear strip is seated into a channel cut into the metal wear strip in the region of greatest direct wear. Should wear be localized, it may be necessary to apply the wear strip only at a corner or other spot of concentrated wear.

Finally, the wear strip of lesser thickness and possibly contoured to the exact area of wear, may be resorted to. In any such instance, it is found that not only is the first cost appreciably reduced, but that the replacement time in any particular replacement operation is appreciably diminished. In the aggregate, during the useful life of a core box, the total replacement time is likewise appreciably reduced, as is the period of lost production. This results in material decrease in the number of core boxes required. Not only will such wear elements outwear the metal inserts from about ten to as much as twenty times, but wear is reduced in the core box itself in the region around the wear inserts. The resistance of wear inserts of the material described to attack by various elements and atmospheric conditions has heretofore been pointed out in detail.

Certain tests have been made, comparing the use of cold-rolled steel, best conventional plastics as hitherto employed for wear purposes, and my new Buna rubber products. The results of these tests have been set up in the following table to permit ready comparison.

Table

Material	Wear Test		Oil Immersion 42 hrs.			
			Hardness		Thickness	
	Loss in wt., gms.	Relative Resist.	Before	After	Before	After
		Per cent				
Cold-Rolled Steel	.671	100				
Best Conventional Plastic	.105	639	69	86	.391	.403
My Products	.045	1,491	68	68	.247	.248

From the foregoing, it is quickly seen that the best plastics heretofore available have had a resistance to wear approximately 6.4 times that of the steel, while my new products display a wear resistance approximately 15 times that of steel. Whereas the conventional plastics display considerable increase in hardness following a forty-two hour immersion in oil, no susceptible increase in hardness is observed in the use of my new products. Similarly, while appreciable swelling is observed in the case of oil submersion of conventional plastics, no appreciable swelling occurs in the use of my new products. All these and many other highly practical advantages attend upon the practice of my invention.

As will be readily apparent from a consideration of the foregoing, many modifications of the present embodiments will suggest themselves to those skilled in the art. As well, many embodiments of the basic inventive concept will likewise readily occur. All these fall within the scope of my invention. Accordingly, I intend that the foregoing disclosure be considered as merely illustrative, and not by way of limitation.

I claim:

As a new article of manufacture, a wear insert for a core box comprising a cylindrical disc of Buna rubber, an annular, metal disc of slightly reduced diameter inserted substantially flush in said Buna rubber disc, and a headed threaded shank of reduced section imbedded at its head end in said Buna rubber disc and bearing by its head against the inner surface of said metal disc and extending through said metal disk and exteriorly of said Buna rubber disc along the longitudinal center line thereof.

THOMAS E. BARLOW.

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