CONVENTION

AUSTRALIA

Patents Act 1990

667643

REQUEST FOR A STANDARD PATENT

AND NOTICE OF ENTITLEMENT

The Applicant identified below requests the grant of a patent to the nominated person identified below for an invention described in the accompanying standard complete patent specification.

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[54]Invention Title:

COATED FASTENER

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[31,33,32]

Details of basic application(s):-

116,758	UNITED STATES OF AMERICA	US	7 September 1993

Applicant states the following:

1. The nominated person is the assignee of the actual inventor(s)

2. The nominated person is
~~- the applicant~~
- the assignee of the applicant
~~- authorised to make this application by the applicant~~
of the basic application.

3. The basic application(~~s~~) was/~~were~~ the first made in a convention country in respect of the invention.

The nominated person is not an opponent or eligible person described in Section 33-36 of the Act.

7 September 1994

Illinois Tool Works Inc.
By PHILLIPS ORMONDE & FITZPATRICK
Patent Attorneys
By

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David B Fitzpatrick

Our Ref : 382257

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COATED FASTENER

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(56) Prior Art Documents
US 3813985

(57) Claim

1. A coated fastener, including:

at least one fastener having a predetermined configuration including at least one portion thereof capable of being driven into a desired surface; and

coating means applied to said fastener, said coating means composed of one-hundred percent plastic resin solids which do not emit any volatile compounds when applied and during curing and covers substantially the entire exterior of said fastener for providing a protective coating to said fastener, for adhering said fastener to at least one other fastener and for providing an irregular surface to said fastener for increasing the holding power of said fastener after it is driven into a desired surface.

AUSTRALIA

Patent Act

COMPLETE SPECIFICATION

(ORIGINAL)

Class Int. Class

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Related Art:

Names(s) of Applicant(s):

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Complete Specification for the invention entitled:

COATED FASTENER

Our Ref: 382257

The following statement is a full description of this invention, including the best method of performing it known to applicant(s):

2210x

COATED FASTENER

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to coated fasteners, and more particularly to a fastener, such as a staple or a nail, having a coating composed of one-hundred percent solids which does not emit any volatile compounds when applied and during curing, covers substantially the entire exterior of the fastener, protects the fastener against corrosion, is capable of adhering successive fasteners together into a strip or block and provides improved retention of the fastener when driven into a desired surface.

2. Description of the Related Art

Fasteners typically are coated to protect the fastener from corrosion and to adhere a plurality of fasteners together into a strip or block for ease of handling with a fastener driving tool. An example of such a coated fastener is illustrated in U.S. Patent No. 3,813,985 which discloses a coating composed of a nitrocellulose resin dissolved in an organic solvent. After the solvent is evaporated the coating remains adhered to the fastener and can be utilized to adhere successive fasteners into a strip.

Upon evaporation of the solvent in such coatings, however, a large amount of undesirable volatile compounds are emitted. To conform to existing government regulations, the emitted volatile compounds must be contained and properly disposed which adds significant costs to the process.

It therefore would be desirable to provide an improved fastener.

SUMMARY OF THE INVENTION

According to the invention there is provided a coated fastener, including:

at least one fastener having a predetermined configuration including at least one portion thereof capable of being driven into a desired surface; and

coating means applied to said fastener, said coating means composed of one-hundred percent plastic resin solids which do not emit any volatile compounds when applied and during curing and covers substantially the entire exterior of said fastener for providing a protective coating to said fastener, for adhering said fastener to at least one other fastener and for providing an irregular surface to said fastener for increasing the holding power of said fastener after it is driven into a desired surface.

The coating is particularly useful when it first is applied to a plurality of metal wires which then are adhered together during curing of the coating to provide a band of adhered wires. The band then is formed to provide a strip of staples or nails for ease of shipping, packaging and loading into a driving tool. Upon separating a fastener from the strip, the irregular surface on the fastener is maintained to provide the increase holding.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of a strip of fasteners including the coating of the invention;

Fig. 2 is a cross-sectional view of a portion of the strip of fasteners taken along line 2-2 of Fig. 1 and in the direction indicated;

Fig. 3 is a perspective view of a single fastener including the coating of the invention;

Fig. 4 is a cross-sectional view of the fastener taken along line 4-4 of Fig. 3 and in the direction indicated;

Fig. 5 is a perspective view of a plurality of fasteners including the coating of the invention illustrated driven into a desired surface;

Fig. 6 is an enlarged partial side elevational view of a fastener including the coating of the invention illustrating the fastener after being removed from a

desired surface; and

FIG. 7 is an enlarged partial side elevational view of a prior art fastener after being removed from a desired surface.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 3, a fastener, such as a staple, is designated generally by the reference numeral 10 and includes a coating 12 of the invention thereon. Although the fastener 10 illustrated throughout the drawings is a staple, it is to be understood that any fastener can be utilized so long as the coating 12 is provided as described herein.

The staple 10 preferably includes first and second legs 14 and 16 interconnected by a a crown 18 and includes the coating 12 substantially about its entire exterior surface. Preferably, each leg 14 and 16 is formed with a chisel point 19 for driving of the staple into a desired surface, but can vary.

As FIG. 1 illustrates, the staple 10 typically is provided in a strip or block 20 where the staples 10 are adhered together by the coating 12 during curing thereof. The strips 20 typically include between fifty and one-hundred staples 10, but the number can vary.

As FIGS. 2 and 4 illustrate, each staple 10 preferably is substantially oval in cross-sectional configuration including substantial planar top and bottom surfaces 22 and 24 and opposite arcuate ends 26. The particular size and shape of the staple 10, however, can vary.

The coating 12 is provided on the entire external periphery of the staple 10, preferably by the method and apparatus shown in co-pending Application No. AU 71670/94 ., entitled "METHOD AND APPARATUS FOR COATING FASTENERS" (Attonery Docket No. 6841) filed concurrently herewith, the disclosure of which hereby is incorporated by reference. That method provides for application of the coating 12 in an electrostatic process, wiping of excess coating 12 from desired portions of stock

metal wires, curing the coating 12 by heating and subsequent cooling to adhere the coating 12 to the wires and adhere successive wires together into a band, and forming the band of wires into a strip 20 of staples 10. It is to be understood, however, that the particular method utilized to provide the coating 12 can vary.

As FIGS. 2-4 illustrate, the coating 12 preferably is slightly thinner on the top and bottom surfaces 22 and 24 than it is on the ends 26 of each fastener 10. The thicker coating on the ends 26 enhances adhesion with an adjacent staple and provides a substantially roughened surface which increases the retention of the staple 10 within a desired surface.

The thinner coating 12 on the top and bottom surfaces 22 and 24 enables the exterior dimensions of the staple 10 to be reduced so the staple 10 will fit within the magazine and bore of a driving tool without jamming. Accordingly, the thickness of the coating 12 can vary depending on the particular application and driving tool utilized.

As FIG. 2 illustrates, due to the shape of the staples 10, a recess 30 is provided between successive staples 10 on both the top 22 and bottom 24 thereof which substantial is filled with coating 12. The coating 12 in the recess 30 provides for increased adhesion between staples 10 and, after a staple 10 is separated from a strip 20, provides an extremely roughened surface on the opposite ends 26. The width of the top of coating within the recess 30 typically is about 30-40 mils, while the depth is abouth 15-25 mils, but can vary.

As FIGS. 5 and 6 illustrate, the coating 12 effectively provides a plurality of randomly spaced barbs on the opposite ends 26 which deform the material of a surface 32, such as wood, into which the staple 10 is driven. The barbs displace wood fibers 34 downward when driven, as FIG. 5 illustrates, which in turn provides increase mechanical retention of the staple 10 within the wood.

As FIG. 6 illustrates, the barbs of the coating

12 rip out substantial pieces of wood fibers 34 when removed. Conversely, as FIG. 7 illustrates, a prior art staple 10a with a nitrocellulose coating 12a does not provide the barbs as does the coating 12 of the present invention and has less retention and fibers thereon.

The coating 12 can be a powder coating, a U.V. cured coating or a water based coating. Preferably, a powder coating is utilized which can be polyester, polyethylene, nylon or epoxy or any other material so long as it functions as described herein.

The preferred powder coating 12 is composed of polyester and is black in color which enhances the curing rate in an IR oven. The polyester coating 12 includes, by weight, from about 80-90 percent polyester resin, 4-5 percent accelerator, 1-2 percent flow control agent, 3-4 percent dispensing agent and 1 percent surface open agent. The accelerator is utilized to increase the reaction rate during curing and preferably is hydroxyalkyl amide. The flow control agent improves the flow and appearance of the coating and preferably is an acrylic based material. The dispensing agent preferably is stearic acid while the surface open agent is benzoin which allows the coating to degas during curing to reduce production of porous and brittle coatings.

The coating 12 preferably is non-conductive so that it can be applied electrostatically and is either black or blue in color, but can vary. It also is conceivable that other thermosetting coatings, such as epoxy, can be utilized.

Furthermore, thermoplastic coatings can be utilized to form the coating 12, such as polyethylene or nylon, so long as the particle size of those materials is ground to be very fine. To obtain such fine particle sizes with thermoplastic materials, however, liquid nitrogen typically is utilized during grinding which adds significant costs to the material.

The following examples illustrate the coating 12 of the present invention.

EXAMPLE I

COMPONENTS	WEIGHT PERCENT
Polyester Resin	89.0
Hydroxyalkyl Amide	4.8
Acrylic Flow Agent	1.6
Benzoin	0.8
Stearic Acid	3.8

The above coating composition provided excellent protection against corrosion, excellent coverage and adhesion between staples 10 and excellent retention within a surface.

EXAMPLE II

COMPONENTS	WEIGHT PERCENT
Epoxy Resin	50.0-70.0
Aromatic Amine	10.0-30.0
Carbon Black	1.0-5.0
Calcium Carbonate	10.0-30.0
Calcium Sulfate	10.0-30.0
Bisphenol A	5.0-10.0

As noted above, the coating 12 substantially increases the holding powder of the staple 10 when driven into a given surface due to the pronounced barb formation provided by the coating 12 as illustrated in FIGS 3, 5, and 6. The barbs on the coating 12 provide a mechanical lock which does not vary with time. The nitrocellulose prior art coating of FIG. 7 provides more of an adhesive or chemical interlock which will lose some of its holding power as the material relaxes after fastener insertion and deformation and upon drying of the material. This process typically occurs within two weeks time.

For example, tests have been conducted with staples 10 including the powder coating 12 thereon inserted within samples of spruce-pine-fir (SPF) wood and removed. Holding power was determined immediately after insertion. The following table summarizes the results of those tests.

TABLE I

HOLDING POWER OF POLYESTER

POWDER COATED STAPLE IN SPF WOOD

SAMPLE NUMBER	FASTENER LENGTH (IN)	PENETRATION DEPTH (IN)	ULTIMATE PULL-OUT VALUE (LBS)	ADJUSTED PULL-OUT VALUE (LBS/IN)
1	.983	.722	133	184.21
2	.983	.715	116	162.23
3	.983	.722	125	173.13
4	.983	.708	104	146.89
5	.983	.682	110	161.29
6	.983	.700	120	171.42
7	.983	.720	104	144.44
8	.983	.732	87	118.85
9	.983	.681	68	99.85
10	.983	.680	70	102.94

The adjusted pull-out value is obtained by dividing the ultimate pull-out value by the penetration depth to eliminate any variances from differences in the penetration depth. The mean adjusted pull-out value for the above samples is 146.52 LBS/IN with a standard deviation of 29.92 LBS/IN.

The mean adjusted pull-out value of 146.52 for the coating 12 is approximately 15% better than the mean

adjusted pull-out value for the same staple coated with a prior art nitrocellulose based coating. Additionally, as described above, the nitrocellulose relies more on an adhesive or chemical holding in the wood which loses some of its holding power, up to 30%, over time due to drying and relaxing of the wood. In contrast, the coating 12 of the invention loses only about 2-3% holding power over time.

Modifications and variations of the present invention are possible in light of the above teachings. It therefore is to be understood that within the scope of the appended claims the invention may be practiced other than as specifically described.

The claims defining the invention are as follows:

1. A coated fastener, including:

at least one fastener having a predetermined configuration including at least one portion thereof capable of being driven into a desired surface; and

coating means applied to said fastener, said coating means composed of one-hundred percent plastic resin solids which do not emit any volatile compounds when applied and during curing and covers substantially the entire exterior of said fastener for providing a protective coating to said fastener, for adhering said fastener to at least one other fastener and for providing an irregular surface to said fastener for increasing the holding power of said fastener after it is driven into a desired surface.

2. The fastener as defined in claim 1 wherein said coating means are a powder coating selected from one of a thermosetting and a thermoplastic material.

3. The fastener as defined in claim 1 wherein said coating means are a polyester resin based coating.

4. The fastener as defined in claim 3 wherein said polyester coating is a powder including, by weight, from about 80-90 percent polyester resin, 4-5 percent accelerator, 1-2 percent flow control agent, 3-4 percent dispensing agent, and 1 percent surface open agent.

5. The fastener as defined in claim 4 wherein said accelerator is hydroxyalkyl amide, said flow control agent is an acrylic, said dispensing agent is stearic acid and said surface open agent is benzoin.

6. The fastener as defined in claim 1 wherein said coating means are an epoxy resin based coating.

7. The fastener as defined in claim 6 wherein said epoxy coating is a powder including, by weight, from about 50-70 percent epoxy resin, 10-30 percent aromatic amine, 1-5 percent carbon black, 10-30 percent calcium carbonate, 10-30 percent calcium sulfate and 5-10 percent bisphenol A.

8. The fastener as defined in claim 1 wherein said coating means are at least one of polyethylene and nylon.

9. The fastener as defined in claim 1 wherein said coating means provide a plurality of barbs randomly positioned about the surface of said fastener.

10. A coated fastener, substantially as hereinbefore described with respect to any one of the embodiments illustrated in any one of drawings 1 to 6.

DATED: 5 September 1994
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Attorneys for:
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ABSTRACT

A coated fastener (10) including a coating (12) comprised of one-hundred percent solids which do not emit any volatile comfounds when applied and during curing, covers substantially the entire exterior of the fastener (10), provides a protective coating (12) to the fastener (10) against corrosion, enables the fastener (10) to be adhered to at least one other fastener (10) and provides an irregular surface to the fastener (10) for increasing the holding power of the fastener (10) after the fastener (10) is driven into a desired surface (32).

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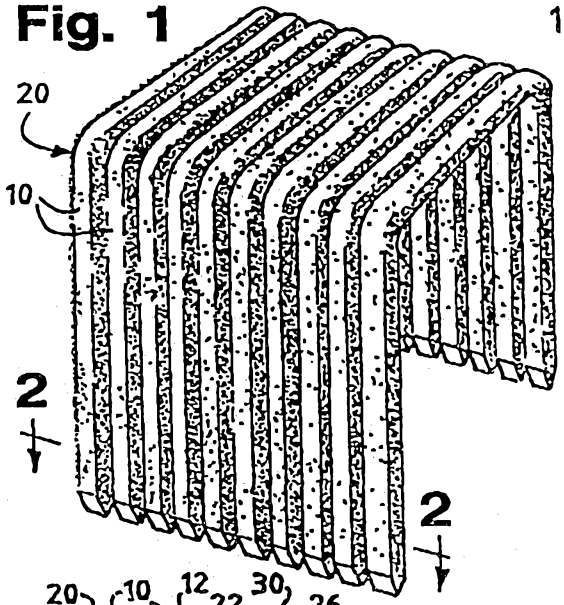
Fig. 1



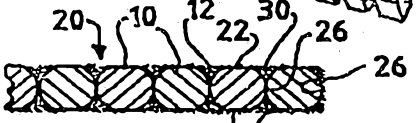


Fig. 2

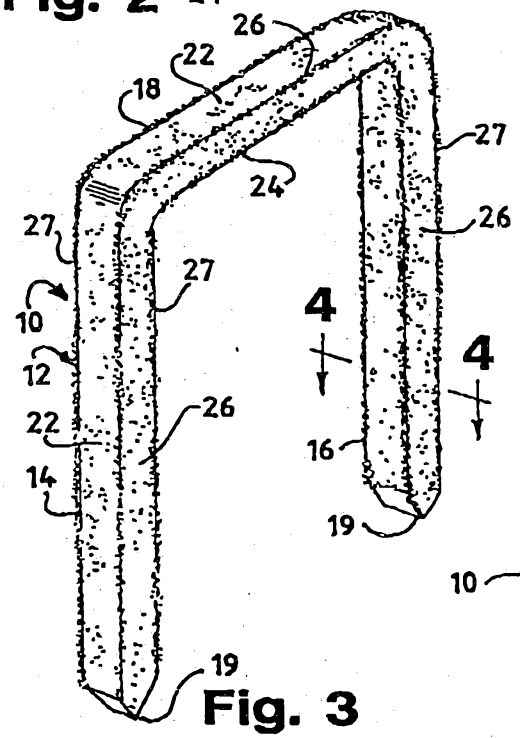


Fig. 3

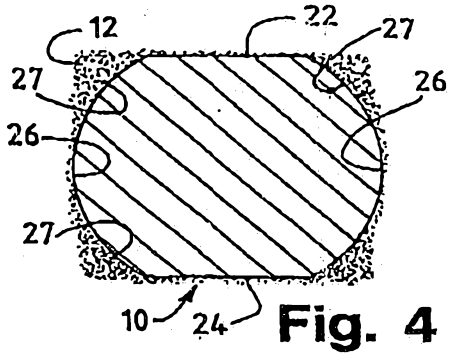


Fig. 4

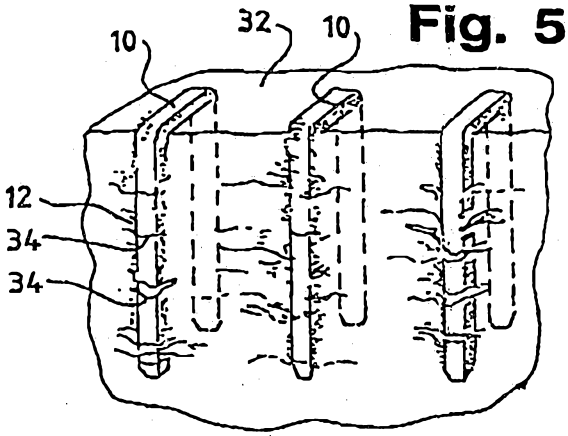


Fig. 5

Fig. 6

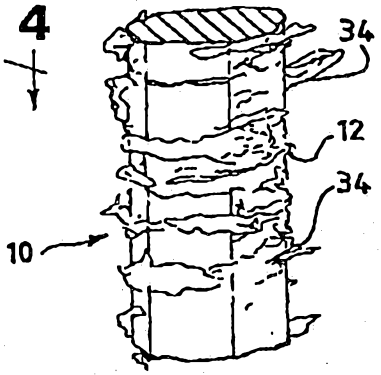


Fig. 7
Prior Art