

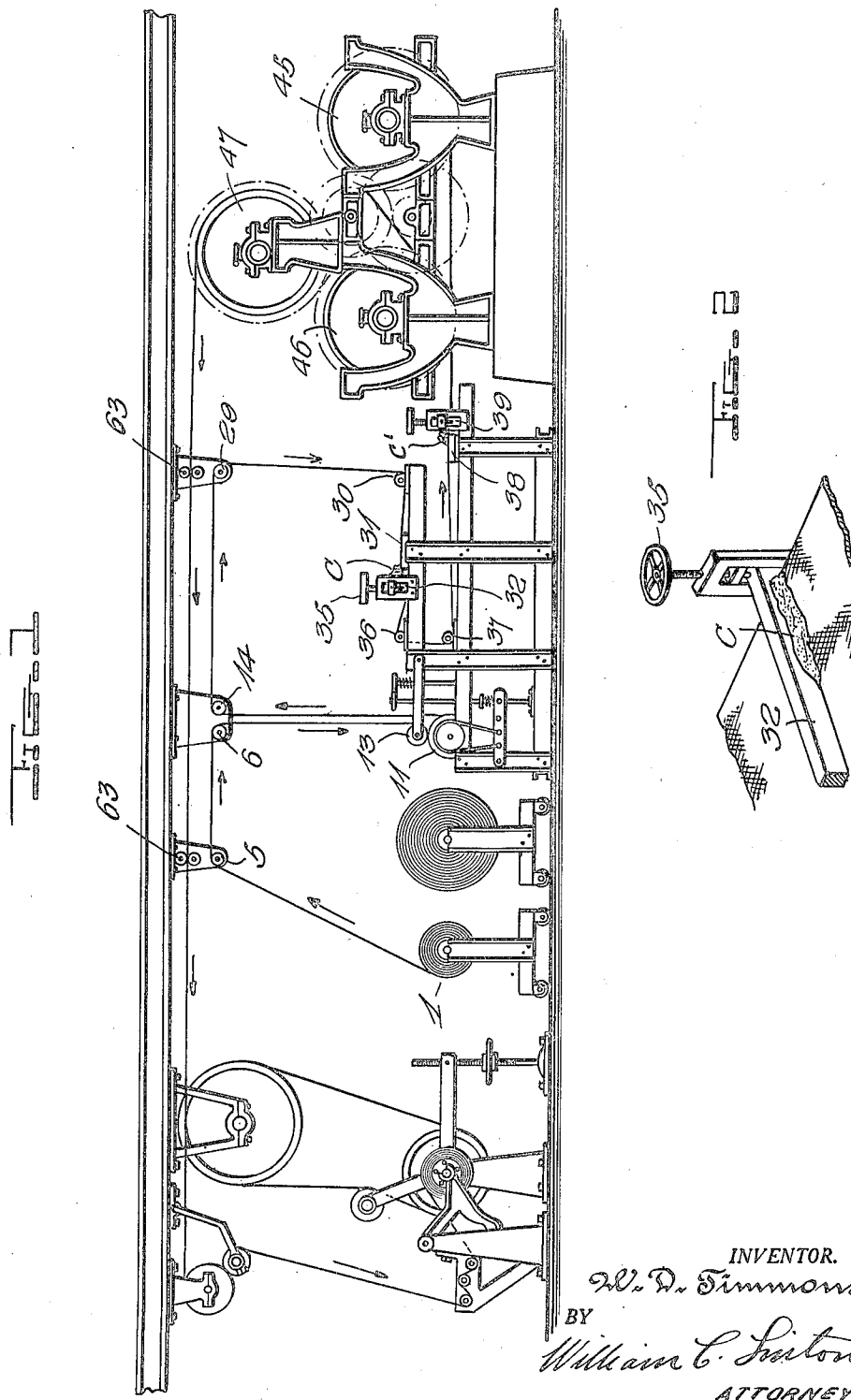
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FIRE-PROOFING COATING METHOD AND PRODUCT

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FIREPROOFING COATING METHOD AND PRODUCT

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My invention relates to a method and composition for protectively treating fabrics and fibrous materials and primarily for making them resistant to fire and glow, and, secondly, making them resistant to moisture, weather, mold, fungus and mildew.

I employ particular resins and particular metallic oxides, and compounds, and apply them in a suitable manner to produce the desired results, which includes heat, and may include application of force.

It has been heretofore known to apply to fabrics, coating compositions containing certain resins, but the results obtained were unsatisfactory as to the purposes here in view, and the prior art has not known the particular compositions and manner of applying the same which I here disclose, and have been found to be most desirable and to produce best results.

My invention is applicable to any cellulosic or fibrous material, for use in either high, low or any intermediate temperature, embracing cellulose or asbestos fibre or fibrous products, wool, cotton, silk, jute, hemp, kapok, synthetic fibres in the yarn or cord or as woven fabrics and to any cellulosic material such as canvas for tents, floor and wall coverings, awnings, tarpaulins, athletic field awnings, boat hatch and truck covers, and also to such products as gloves, welders shields and welders clothing, mine brattice sheeting, irrigation ditch linings, beltings, brake linings, mine ventilating tubing and refrigerating piping, and to a wide variety of other uses.

I find that the application of the particular resin which I disclose, with the particular metallic oxides with or without certain other substances which I disclose, and in the particular manner which I disclose, produces a result which is of a superior and different nature to that obtained by separately applying the resin or the oxide.

An object of my invention is to provide a coating method and composition which will render a fabric substantially and permanently fireproof and glow-proof, resistant to flameless slow glowing combustion, charring and to flame propagating burning, being water-, weather-, mold-, fungus- and mildew-proof.

Another object of my invention is to perform a coating operation under maximum safety conditions including the avoidance of volatile solvents, and while producing a better coated fabric for the intended purposes, utilizes readily avail-

able resins and oxides and results in a lower cost than other known methods.

Still another object of my invention is to provide a rapid coating process which avoids the extended drying periods heretofore required with fabric coating compositions and methods using large quantities of volatile solvents.

A further object is to apply equally all substances in the coating compound upon the fabric to produce a smooth, even and thin coating thereon and in such a manner as to drive the coating composition into the fibers of the fabric and make it an integral part thereof thereby making a smooth, better looking and tougher fabric, and giving increased strength and longer life thereto.

Another object of my invention is to provide a water, fire and glow resisting fabric, the color of which may be standardized and which may be produced in a substantially white color and which is substantially permanently resistant to outside weathering.

Another object of my invention is to produce a fabric resistant to water, fire and glow with a minimum of additional weight from the coating composition so that the coated fabric could be used for clothing, curtains and like materials of light weight.

Other objects of my invention will be apparent from the following specification and the accompanying drawing wherein:

Figure 1 is an elevation of a coating machine suitable for applying the coating composition to a fabric, and the application of heat and force if desired thereto, and

Figure 2 is a perspective view of an applicator element for applying the coating composition.

Heretofore, in the art, certain compositions have been known which accomplish "fire-proofing" of canvas and other fabrics, that is, render them substantially resistant to active combustion or flaming under applied ordinary flame. However, fabrics treated with various of these compositions are not glow-proof, that is to say, under applied ordinary flame, or even under applied continued glowing heat, they commence a slow glowing or flameless combustion or after glow which gradually may eat into the fabric until it is entirely destroyed or seriously charred, or so extensively otherwise damaged as to be useless.

Furthermore, in the prior art, the use of compositions depending on flame extinguishing gases, resulted in a deterioration of the fabric from the releasing of the flame inhibitor. This objection-

able feature was found present in the use of some of the non-volatile chlorinated hydrocarbons heretofore proposed.

The method and composition which I describe produces a fabric which is markedly fire resistant, and while the fabric may char in a small local area under applied heat, no injury will result to any adjacent area by glow propagation, and the fabric will not be weakened or its useful qualities lessened by reason of any disintegrating flame or glow inhibitor.

The method and composition which I describe produces a fabric which is weather resistant, that is, under exposure to ordinary weather conditions, the composition does not leach out of the fabric or otherwise become ineffective in the fabric. The method and composition which I describe not only do not weaken the fabric, but give it added body and additional tensile strength. The life of the fabric is extended among other reasons because of the binding and adhesive qualities of the composition and of the method which I employ. Fabrics coated and impregnated with the composition which I describe become permanently weatherproof, and no harmful vapors are released from the fabric which would decrease weathering resistance of the fabric.

The fabric coated with my composition in the manner which I describe, has better waterproof qualities than those heretofore known, because my composition is applied much more thoroughly, completely and evenly than those applied with solvents heretofore employed, and the compound is pressed into the interstices in a more condensed and deeper impregnation and penetration and no openness remains through the finished fabric due to solvent evaporation.

My method does not involve the necessity for evaporation of any constituent of the coating composition, but operates by thermoplastic action, which while constituting a continuous mixing operation, uses on each unit of fabric the same amount of each ingredient of the compound as used on every other unit of material. The coating composition is applied in thin, even coats, and may then be struck by heat applications of suitable temperature which is not high enough to injure the fabric, and which drives the composition into the fabric from both sides and fuses it therein, giving deep penetration and strengthening of the fabric. The coating process is thereby completed and the material may be immediately packed and shipped.

The use of volatile solvents as ordinarily employed for resins requires a long period of drying and constitutes a fire, explosion and health hazard from the objectionable fumes and odors. I preferably do not use volatile solvents.

I prefer to employ a coumarone-indene resin, and for most applications, may use one of relatively low melting point, as somewhat below the boiling point of water, but I prefer a blend of two resins with a low and a higher melting point, producing the relatively low melting point resultant.

As the metallic oxide or compound, I preferably employ antimony oxides as commercially furnished in a mixture of several of its oxides. If a decided light or white color of the coating is desired, it is preferable to use the antimony trioxide Sb_2O_3 in combination with titanium dioxide.

I have found that if protection against infrared rays is desired, pigments containing black shall generally be avoided and pigments contain-

ing suitable red or orange undertones incorporated, and I preferably employ antimony trisulphide, Sb_2S_3 , either alone or in combination with an antimony oxide.

I can, however, also employ certain other hydrated oxides and hydroxides of tin, lead, aluminum, etc., or combinations of these, either alone or together with antimony oxides. I have further employed certain other metallic oxides, but with results not as good as with antimony oxides.

Of the metal compounds used as fire-proofing and glow-proofing agents specified herein, antimony oxide and sulphide and tin oxide are both very practical. These are compounds of somewhat similar metals.

Under some conditions, or to produce a material for a particular purpose it may be found desirable to apply a conventional plasticizer to the comminuted material, such as tri phenyl phosphate.

To produce a certain color in the fabric it may be found desirable to add a suitable pigment which does not support combustion such as titanium oxide, chromium oxide or iron oxide.

I have also found it desirable for certain fabric uses to blend the resin with certain asphaltums and bitumens and to add conventional fillers and thinners, and conventional mildew proofing agents may be added such as copper oxide, and copper chromate.

In Figure 1, I have shown a coating machine which is suitable for using the method and applying the coating composition which I here disclose. This machine is substantially the same as the machine described in my Patent No. 1,729,368, issued September 24, 1929, for the practice of a different method and for applying a different composition. Reference may be made to my said Patent No. 1,729,368 for a detailed description of the construction of the coating machine.

The web of fabric passes from loading reel 1 over rolls 5 and 6 around an idle roll 13 and a tensioning roll 11, thence upwardly over a roll 14 and an idle roll 20, downwardly over a roll 30, and thence to an idle roll 36. In passing between rolls 6 and 14 over tensioning roll 11, the web is stretched. Between rolls 30 and 36 the web passes over a bed plate 31 and beneath a material applying blade 32 mounted in suitable guides. The spacing and pressure between blade 32 and bed plate 31 may be adjusted by hand wheel 35. The resin and oxide or other compound to be applied, is disposed in bulk, as indicated by reference character C, upon the upper surface of the fabric and adjacent blade 32. As the fabric is drawn beneath the blade 32, and over base plate 31, the fabric is squeezed therebetween and a quantity of the composition will be taken up by the surface of the fabric and will be applied thereto in a thin even film or layer.

From roller 36 the web passes over idle roll 37 and then to the first heating drum 46, during which travel its previous top surface has become its bottom surface. Between roll 37 and drum 46, the web passes over a second bed plate 38 and beneath a second material applying blade 39. The semi-plastic or comminuted resin and oxide or other compound is disposed as shown at C' upon the other surface of the web of the fabric to which comminuted material has not yet been applied. The blade 39 causes the fabric to take up the comminuted material on the second side of the web also.

The web of fabric successively passes tightly

drawn over the three drums 46, 45 and 47, and these drums are maintained at the desired temperature by application of heat supplied thereto by heated oil, steam, electricity or any other suitable means. In the practice of the method which I here disclose, I prefer to maintain these drums at a temperature between 225 and 260 degrees Fahrenheit.

From the final drum 47, the web of fabric passes over idle guide rolls 63 and straightening rolls to a takeoff roll.

The web of fabric as it passes over the three drums 45, 46, 47, is under tension, and pressure may also be applied at this point.

As the fabric which has taken up on both its sides some of the comminuted coating composition, is drawn tightly over the heated drums as they rotate, the coating composition will be caused to permeate the material from both surfaces and to be forced into the interstices of the fabric where a part of the compound will be held in a condensed and compact mass and sealed in by the fusing of the composition on both surfaces of the fabric and thus become intimately incorporated therein and thereon.

If the uses to which the fabric is to be subjected do not require as complete treatment as above set forth, only one side of the material need be coated, in which case no compound is applied as the fabric passes over bed plate 33 and applying blade 39 is raised so that no pressure is exerted on the fabric as it passes this point.

In operation, the speed of the machine, the pressure on the fabric and the temperature of the heating drums must be adjusted according to the physical characteristics and the width and thickness of the fabric.

The passage of the fabric over the hot rolls 46, 45 and 47, aids in giving a more complete and more uniform impregnation of the fabric, with the mixture.

In order to secure the most suitable treatment for any fabric required for a particular use, I have experimented with many formulas and have found the following most satisfactory.

For applications where actual tackiness or lubrication factor is desirable in the finished fabric, such as fire resistant tapes and bandages, and fabrics used for hinge action, and adhesive or non-slip rug underlays, and acoustical and heat insulating fabrics for automotive or aviation construction, I find it desirable to employ as the resin ingredient, a coumarone-indene resin of quite low melting point such as 41 to 59 degrees Fahrenheit, or even lower, which is known as a plastic type and is commercially procurable in viscous form, and to use six to eight parts by weight of this low-melt resin to five parts by weight of the mineral ingredient, which as I have stated is preferably antimony oxides, although I may also use antimony sulphides. I apply a heat preferably of 225 to 250 degrees Fahrenheit to the drums in heat treating the fabric carrying this low-melt resin.

For applications where the fireproofed fabric is to be exposed to cold temperatures, such as ice cream packers' dry ice containers, highway truck covers, boat and hatch covers, canvas covers for refrigerating equipment and piping, I find it desirable to employ as the resin ingredient, a coumarone-indene resin of relatively low melting point such as 59 to 140 degrees Fahrenheit, which is known as a plastic or special soft or rubber soft rubber type and is commonly procurable in viscous to solid form, and to use eight to twelve

and one-half parts by weight of this resin to five parts by weight of the mineral ingredient which I have set forth. For this resin also I apply a heat of 225 to 250 degrees Fahrenheit to the drums. This composition can also be used under conditions where some tackiness would not be objectionable, such as air filter bags and air cleaning bags where some tackiness is desirable. This coated material also offers higher resistance to sea water than when higher point resins are used.

Where the coated material may be exposed to a somewhat higher temperature range, and where high pigmentation is desirable for canopies, awnings, and advertising medium base, or where high flexibility is required for draft and ventilating tubing and drapes, or where high slippage is specified for truck, movable hatch covers and railroad car floor covers or for general use in tentage, fixed decking and floor covering, I find that it is desirable to employ as the resin ingredient, a coumarone-indene resin of intermediate melting point of 140 to 194 degrees Fahrenheit, which is classed as a medium soft to rubber hard rubber type and is procurable in solid form, and to use twelve and one-half to fifteen parts by weight of this resin to five parts by weight of the mineral ingredient which I have set forth. For this resin also I apply a heat of 225 to 250 degrees Fahrenheit to the drums. This temperature range of material allows higher pigmentation, affording greater protection by wear from friction and abrasion where the material is used for decking or floor covers subject to sliding wear such as draft and air conductor hose, and folding bellows and canopies.

This melt point range plus the addition of a higher melt point indene resin, allows paintability for use as a base for advertising signs without bleeding of the base into the painted image.

For high temperature applications where the material is to be exposed to relatively high temperature in industrial uses such as welding shields, welders' clothing (cuffs, leggings, gloves, jackets, etc.), ventilating ducts where very limited flexing is encountered, for agricultural uses such as irrigation ditch linings subjected to acid or alkaline soil or water conditions, for tropical high temperature plant, tree, man and animal covers, and in general for gloves, tropical tents, luggage parts and any textile application where additional handle or body is needed to increase stiffness or weight of lighter fabrics, I use as the resin ingredient, a coumarone-indene resin of melting point between 194 and 250 degrees Fahrenheit, which may be procured in flake form, and I use fifteen to seventeen parts by weight of this resin to five parts by weight of the mineral ingredient which I have set forth. For this resin I apply a heat of 240 to 260 degrees Fahrenheit, but always enough heat to melt the resin.

It will be understood that the above mentioned roll temperatures are the temperatures at which the rolls are maintained, and the fabric passing through, will be heated to a somewhat lower temperature thereby. The roll temperature heats the resin sufficiently to thoroughly fuse the same and to cause it to coat and impregnate the textile material. The heat of the rolls also will heat the fabric sufficiently to dry out its moisture content. Usually the above stated roll temperatures will heat the textile fabric to about 202 to 210° F.

For application to all of these different temperatures, I find that the use of antimony oxides as

the mineral ingredient, produces the most satisfactory results.

I may also use suitable pigments, conventional plasticizers fillers, stabilizers, germicides and thinners as required to produce a fabric best adapted to the required uses in the formulas herein set forth.

As a single preferred formula for general applications, with satisfactory results in a wide variety of applications, such as tentage, awnings, decking, and the like, for use at temperatures generally met in the temperature zone, I find it preferable to employ as the resin ingredient, a mixture of a relatively low melting point coumarone-indene resin or of equal parts of a low melting coumarone-indene resin melting at 68 to 86 degrees Fahrenheit and a high melting coumarone-indene resin melting at 203 to 250 degrees Fahrenheit, and to use ten parts by weight of this resin mixture to four parts by weight of the antimony oxides, and three parts by weight of a suitable plasticizer such as triphenyl phosphate. For this composition I apply a heat of 225 to 260 degrees Fahrenheit.

To this preferred composition it is often desirable to add one or more suitable inert pigments such as iron oxides, titanium and tin oxides, because combinations of certain of these pigments seem to increase the properties of the other oxides and thereby produce greater fire, glow, weather and moisture resistance.

I have found that certain oxide combinations such as antimony oxides and titanium di-oxide which I have described as preferred ingredients, are found to produce much less wear and scouring to cutting equipment and sewing machines than some other oxides such as iron oxides, and that a slight addition of lead oxide to the pigmentation will considerably reduce the frictional wear of any of the other oxides.

In the methods and coating compositions heretofore employed in the prior art, there is required the use of a color pigment to protect the fabric against weathering, and dechlorination, which pigment produces a dark colored fabric which is undesirable for many uses. On the other hand, using my preferred composition with antimony tri-oxide, there is produced a coating of light color, and by using my preferred composition with the addition of titanium oxides, there is obtained a clear white coated fabric which is substantially permanently fire-proof, glow-proof, as well as moisture- and weather-proof, and which can be used for outside purposes without deterioration of its qualities, which kind of fabric has not been heretofore obtainable by any known method.

It will be further understood that upon the development of any new melt point paracoumarone indene, or of any new blend thereof, or for coating a fabric for any special use, I may use any melt point paracoumarone indene resin or blend thereof in combination with metallic oxides and suitable pigments, plasticizers, stabilizers, germicides, and thinners within the contemplation of this invention.

I have found by extended tests that the coating method and compositions which I have described produce important and highly satisfactory resultant white and colored fabrics which are substantially permanently fire-proof and glow-proof as well as moisture-proof and mold, mildew and fungus proof, and which withstand weathering, and give long life under exposure to rigorous conditions, under various degrees of temperature,

and which results have not been obtainable heretofore.

It will be obvious to those skilled in the art that modifications in the method and compositions which I have described may be made without departing from the spirit of my invention, and all such modifications which are comprehended within the scope of the appended claims I consider to be a part of my invention.

I claim:

1. A process of fire-proofing and glow-proofing a textile material which comprises impregnating the same with coumarone-indene resin and a water-insoluble solid antimony compound selected from the group consisting of antimony oxide and antimony sulphide.

2. A process of fire-proofing and glow-proofing textiles which comprises impregnating the same with a composition containing a major proportion of a coumarone-indene resin and a minor proportion of a fire-proofing agent which is a water insoluble solid antimony compound selected from the group consisting of antimony oxide and antimony sulphide, such composition being free from volatile solvents, and applying heat during such impregnating step, sufficient to fuse such resin.

3. A process of fire-proofing and glow-proofing textiles which comprises impregnating the same with a composition containing a major proportion of a coumarone-indene resin and a minor proportion of a fire-proofing agent which is a water insoluble solid antimony compound selected from the group consisting of antimony oxide and antimony sulphide, such composition being free from volatile solvents, and passing such textiles, during said treatment through pressure rolls maintained at 225 to 260° F.

4. A process of fire-proofing and glow-proofing textiles which comprises impregnating the same with a composition containing a major proportion of a coumarone-indene resin and a minor proportion of a fire-proofing agent which is a water insoluble solid antimony oxide, such composition being free from volatile solvents, and passing such textiles, during said process, through pressure rolls maintained at above the melting point of said resin.

5. A process of fire-proofing and glow-proofing textiles which comprises impregnating the same with a composition containing a major proportion of a coumarone-indene resin and a minor proportion of a mixture consisting at least largely of a mixture of antimony oxide and antimony sulphide, such composition being free from volatile solvents, and applying heat during such impregnating step, sufficient to fuse such resin.

6. A process of fire-proofing and glow-proofing textiles which comprises impregnating the same with a composition containing a major proportion of a coumarone-indene resin and a minor proportion of a fire-proofing agent which is a water insoluble solid antimony compound selected from the group consisting of antimony oxide and antimony sulphide, such composition being free from volatile solvents, and free from solid halogenated hydrocarbons.

7. A process of fire-proofing and glow-proofing textiles which comprises impregnating the same with a composition containing a major proportion of a coumarone-indene resin and a minor proportion of a fire-proofing agent which is a water insoluble solid antimony compound selected from the group consisting of antimony oxide and antimony sulphide, and titanium dioxide, the

latter being in amount sufficient to render the product white, such composition being free from volatile solvents, and applying heat during such impregnating step, sufficient to fuse such resin.

8. A process of fire-proofing and glow-proofing textiles which comprises impregnating the same with a composition containing a major proportion of a coumarone-indene resin and a minor proportion of a fire-proofing agent which is a water insoluble antimony compound selected from the group consisting of antimony oxide and antimony sulphide and a pigment, such composition being free from volatile solvents, and free from solid halogenated hydrocarbons, and applying heat sufficient to fuse such resin during said treatment.

9. A composition suitable for fire-proofing textile material to impart fire, glow and water resist-

ance to said textile material, said composition containing a major amount of coumarone-indene resin and a minor amount of an antimony compound selected from the group consisting of antimony oxide and antimony sulphide.

10. A textile material, impregnated with a mixture of coumarone-indene resin and a water-insoluble solid binary compound of antimony selected from the group consisting of antimony oxide and antimony sulphide.

11. A process of fire-proofing and glow-proofing a textile material which comprises impregnating the same with a blend of high melting point and low melting point coumarone resin and a water-insoluble solid antimony compound selected from the group consisting of antimony oxide and antimony sulphide.

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