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PROCESS OF USING A MASKING COATING OF A TELOMER OF TETRAFLUOROETHYLENE

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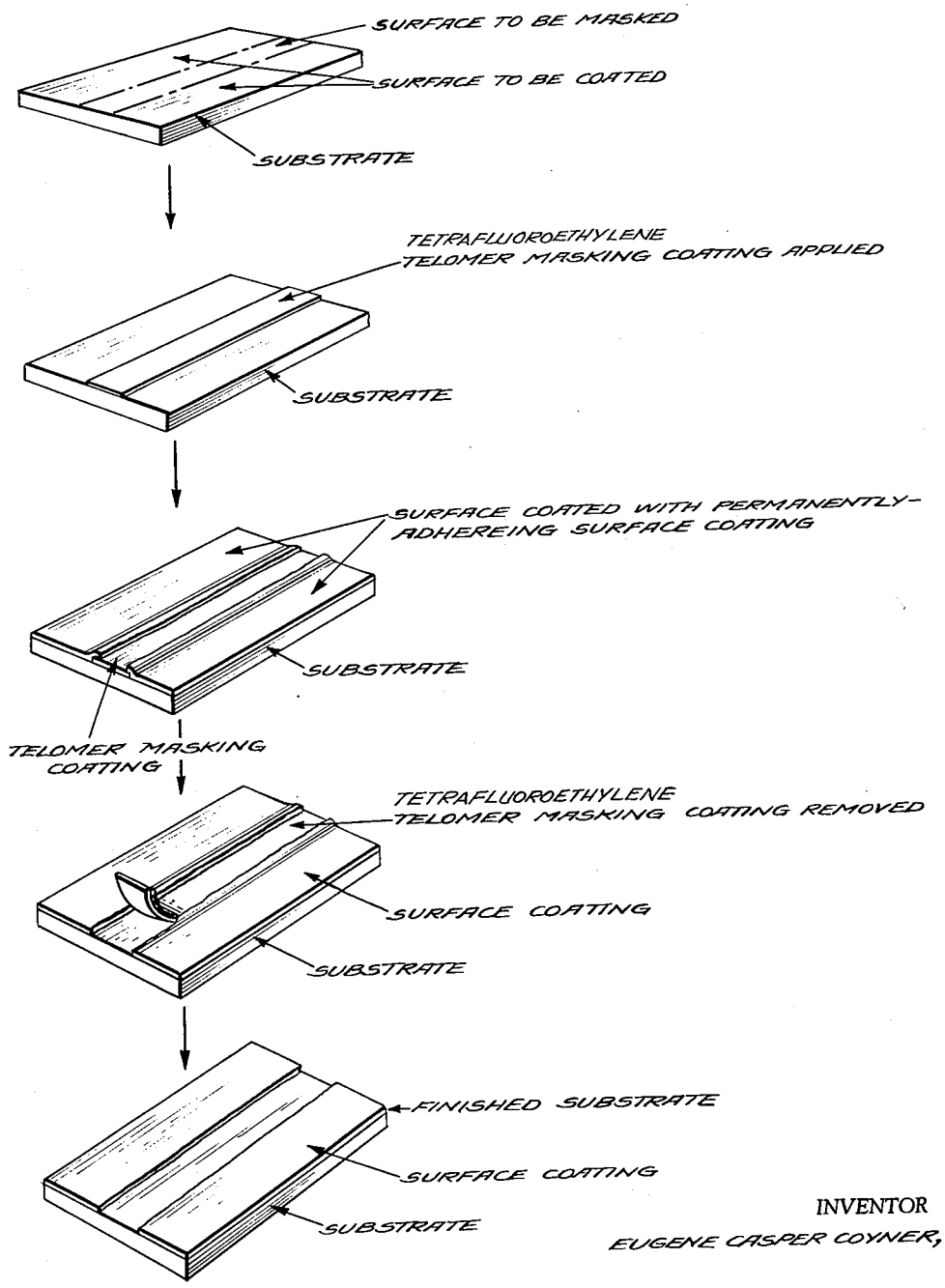

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PROCESS OF USING A MASKING COATING OF A TELOMER OF TETRAFLUOROETHYLENE

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6 Claims. (Cl. 117—5.5)

This invention is directed to coatings of telomers of tetrafluoroethylene as antiadhesives for paint, lacquer or other surface coatings. More particularly, the present invention relates to the use of telomers of tetrafluoroethylene to protect surfaces from paint, lacquer or other surface coatings while nearby surfaces are being painted. Usually, when an object is being painted, it is desirable to prevent paint from accidentally adhering to portions of the object or nearby objects. Thus, when painting window frames, it is desirable to prevent paint from adhering to the glass; when painting walls, it is desirable to prevent paint from adhering to the ceiling and floors and, when painting automobiles, it is desirable to prevent paint from adhering to the windows and bright metal fittings. A large number of such situations could be mentioned.

There are methods known which will permanently protect a surface from paint. One such method is a permanent coating of polytetrafluoroethylene. Paint does not adhere well to polytetrafluoroethylene surfaces. For most applications, however, a permanent form of protection is not desired. Means of temporary protection vary with the situation. Large areas only remotely connected with the area being painted can be covered with cloth or paper and smaller areas with "masking tape." These methods are adequate when only casual protection is needed, such as floors and furniture in a room being painted. When, however, the area to be protected is close to or adjacent to the area being painted, the use of cloth, paper or masking tape fails to serve the purpose. To be effective, the area being protected must be completely sealed from paint or the paint will run under the covering and onto the area being protected. Even when using masking tap, complete sealing is difficult and time consuming to obtain.

An ideal method of protection which meets all possible types of application is a subsatnce which could be applied to any surface, completely sealing same from paint, and which could be readily removed later. One approach to this ideal is a now commercially available material consisting of a pigmented vinyl type resin dissolved in an organic solvent. The material may be applied by means of a spray, brush or dipping. It has several disadvantages however. When applying the material, the same care must be taken, if the areas to be protected and painted are in juxtaposition, as when applying paint for the protective coating must be kept off the area to be painted. Second, the material is slow drying, causing considerable delay between application and use. Third, the organic solvent is flammable. Fourth, the organic solvent limits its usefulness since organic solvents damage some surfaces such as varnish. Last, the material cannot be used effectively as a spray since the area covered is determined only by the general characteristics of the spray pattern; any apparatus used to guide the direction of the spray stream rapidly collects the material impinging on it and becomes heavily coated.

Accordingly, it is an object of this invention to provide a coating composition which is easily removable and which may be readily applied to any type of solid surface, as an undercoating, without the heretofore described adverse effects. Another object is to prevent paint, lacquer or other surface coatings from adhering to the surface coated with this novel composition.

It is a further object of this invention to provide a novel coating composition which may be readily and rapidly applied by any of the known means for applying liquid dispersions to solids to meet the requirements of different end uses. A still further object is to provide a novel coating composition which does not require an excessive time between application as a coating and use as such. Another object is to provide a coating material which allows ready and complete removal of a surface coating that is applied thereover. It is a still further object of this invention to provide an easily removable undercoating composition which is nonflammable and that possesses no undesirable physiological properties.

These and other objects will become apparent in the following description and claims.

More specifically, the present invention is directed to a coating of a telomer of tetrafluoroethylene on various surfaces obtained by application of a dispersion of said telomer in water or an organic solvent to said surface, said coating enabling the easy removal of subsequently applied surface coatings from the surface by stripping or peeling of the dried surface coating.

Typical materials, the surfaces of which may be coated according to the present invention, include wood, metal, glass, plastics, rubbers, ceramics, painted and other surfaces normally encountered. Representative surface coatings which may be applied include various paints, lacquers, and other surface coatings available in the trade.

The telomers of tetrafluoroethylene operable according to the present invention include those telomers obtained from methylcyclohexane, methyl siloxanes, silicones, carbon tetrachloride, chloroform, dialkyl phosphites and alcohols such as methyl alcohol. The method of preparation of these telomers involves telomerizing tetrafluoroethylene with the heretofore-described telogens in a trichlorotrifluoroethane solution. Such telomer dispersions include:

Telogen	Percent A.I. in $C_2F_3Cl_3$	M.P. ° C.	Solvent Free Telomer		Others
			Percent F	Percent Cl	
Diethyl phosphite	8	265–285	60.2	2.6	C, 22.8; P, 2.8.
Methyl alcohol	7	298–300	70.7	1.1	C, 24.2.
Polysiloxane	8	285–300	56–65	1	Si, 1.2–2.5.
Methylcyclohexane	11	270–284			

The heretofore described telomers consist of molecules of type $X(CF_2CF_2)_nY$ wherein n is an integer of from 10 to about 200, i.e., molecular weights of about 1000 to about 20,000. X and Y are the component parts of the telogens, i.e., H and C_7H_{13} from methylcyclohexane, H and a silicon containing group from the siloxanes and silicones, H or Cl and CCl_3 from $CHCl_3$ and CCl_4, H and $P(O)(OR)_2$ from dialkyl phosphites and H and R_2COH

from aliphatic alcohols (R may be H or an alkyl group). The telomers are obtained as dispersions in trichlorofluoroethane and, in the preferred embodiment, are used as such. In some cases, water or another organic solvent may be used in place of trichlorotrifluoroethane if desired.

The telomers of tetrafluoroethylene used in the practice of the present invention are waxlike solids which are obtained as dispersions in trichlorotrifluoroethane ("Freon-113"). The solids may be collected and redispersed in water or almost any organic solvent, if desired. Thus, dispersions can be prepared to fit desired requirements. Trichlorotrifluoroethane is, however, the dispersant of choice. The dispersion of telomer can be applied to the surface to be protected by spraying, painting or dipping.

The telomer dispersions are particularly adaptable to application by an aerosol formulation. When combined with an especially designed spray guide which limits the area covered by the spray, small or quite definite areas can be readily protected. The sprayed material does not adhere to the guide. As pointed out in the present specification, other types of materials now available for protecting objects from paint cannot be applied readily via an aerosol type of dispenser. Without a spray guide, the area covered cannot be easily controlled; the commercially available materials tend to adhere to and collect on any spray guide used.

There are numerous uses for the aerosol form of applying the telomers; one of particular interest is the painting of window frames. The telomer dispersion can be applied to the glass adjacent to the frame without affecting the frame itself and, at the same time, completely protecting the glass. After painting is complete, the excess paint and telomer coating are readily removed. The use of the telomer dispersions is not limited to the convenient aerosol method of application; the same function can be accomplished by other methods. For instance, if a specific area is to be protected, the telomer dispersion can be painted over a stencil defining the area.

Other uses of the telomers include repainting automobiles, where the glass and bright metal fittings can be easily protected while the new finish is applied; protection of trim and other surfaces while painting houses; the protection of handles, drawer pulls, etc. when refinishing furniture; the protection of bright metal objects when painting boats. The telomer dispersions may be applied to and are effective on almost all non-porous surfaces. The dispersing liquid of choice is trichlorotrifluoroethane since its toxicity is very low, it is nonflammable, it evaporates rapidly and it is harmless to almost all surfaces. Other dispersing liquids can be used if, for some reason, the one of choice is unsuitable. Thus, if a less volatile liquid is desired, water, 1,2-difluorotetrachloroethane or perchloroethylene can be used. Other organic solvents such as toluene, xylene or glycols can be used but are less desirable due to their flammability, toxicity and harmfulness to some surfaces.

The telomer compositions of the present invention form durable but not permanent coatings. After serving their purpose, they are readily removable such as by washing with soap and water. Application of the dispersion to the surface is the only treatment required. The surface coating can be buffed but it serves no necessary function.

The primary property of coatings of the subject telomers is that paint coatings will not adhere thereto. Several useful applications of this property have been described; many others will be apparent to those familiar with the art. The examples which follow demonstrate the usefulness of the telomer coatings. Comparisons are made with other methods of protecting surfaces from paint adhesion. These comparisons demonstrate the superior properties of the telomer coatings. These examples are for sake of illustration and are not meant to limit the scope of the invention.

Representative examples illustrating the present invention follow.

EXAMPLE 1

Coupons of tin-coated steel of the type used for manufacture of motor oil cans were prepared. These consisted of a strip of metal 6–8 inches long and 1½ inches wide, formed to a sharp point at the last inch of one end. Any adhering oil and wax was removed with trichlorotrifluoroethane before use. The protective coatings were applied as indicated in Table I which follows and allowed to dry; then they were immersed in an alkyd enamel to a depth of four inches for five minutes and hung up to drain and dry. The ease of removal of the paint is indicated in Table I.

Table I

Protective Coating	Application	Adhesion of Paint
1. Telomer,[a] 1% A.I. aerosol	Sprayed on once	Easily removed.
2. Telomer,[a] 11% A.I. dispersion in $C_2F_3Cl_3$.	Dipped once	Do.
3. Paraffin wax, 1% A.I. aerosol.	Sprayed on, buffed.	Adheres firmly.
4. Paraffin wax	Rubbed on 3 times, buffed.	Do.
5. Carnauba wax[b]	Rubbed on 2 times, buffed.	Do.
6. Silicone DC 200[c]	Liquid rubbed on.	Do.
7. Silicone DC 550[c]	do	Do.
8. Kel-F fluid[d]	do	Do.
9. Kel-F grease[d]	Grease rubbed on.	Do.
10. Fluoropolymer[e]	Dipped once	Adhesion slightly weakened.
11. Fluoropolymer[f]	do	Do.
12. Polytetrafluoroethylene[g] 60% A. I. dispersion.	do	Easily removed.
13. Polytetrafluoroethylene 15% A.I. dispersion.	do	Slightly weakened.

[a] Tetrafluoroethylene telomer derived from methylcyclohexane.
[b] A wax derived from vegetable sources.
[c] Polysilicones of viscosity in centistokes 200 and 550.
[d] Polymers of chlorotrifluoroethylene of liquid and grease-like consistency.
[e] A dispersion in aqueous acetone of a homopolymer of $C_8F_{17}SO_2N(C_3H_7)CH_2CH_2O_2C{-}CH{=}CH_2$ containing a cationic surfactant.
[f] Same as (e) above, except it contains an anionic surfactant.
[g] Dries very slowly.

The results of these experiments demonstrate the superiority of telomers as antiadhesives for paint. Item 12 also acts as antiadhesives for paint but note the very high concentration of active ingredient; item 13 indicates that the high concentration is necessary. Two other materials, items 10 and 11, slightly weakened the paint adhesion but not enough to be useful.

EXAMPLE II

Microscope slides were cleaned by wiping. They were then treated with the various protective agents as shown in Table II and allowed to dry. An alkyd enamel was then applied and allowed to dry. The results are shown in Table II.

Table II

Protective Coating	Application	Adhesion of Paint
1. Telomer,[a] 11% A.I. dispersion in $C_2F_3Cl_3$.	Dipped twice	Easily removed.
2. Silicone DC 550[b]	Liquid rubbed on.	Adheres firmly.
3. Kel-F fluid[c]	do	Do.
4. Paraffin wax, 1% A.I. aerosol.	Sprayed on and buffed.	Adheres strongly.
5. Control		Adheres firmly.

[a] See footnote (a), Table I.
[b] See footnote (c), Table I.
[c] See footnote (d), Table I.

Again, the tetrafluoroethylene telomers are superior to other protective agents, in this case on glass. Telomers were the only successful agents.

EXAMPLE III

Pieces of new plywood (2" x 2" x ¼") were treated with the protective agent in the manner shown in Table

III. The surfaces were then painted with an alkyd enamel and allowed to dry. The results are shown in Table III.

Table III

Protective Coating	Application	Adhesion of Paint
1. Telomer,[a] 11% A.I. dispersion in $C_2F_3Cl_3$.	Dipped and dried twice.	Easily removed.
2. Silicone DC-550 [b]	Rubbed on twice	Adheres firmly.
3. Kel-F liquid[c]	do	Do.
4. Paraffin wax, 1% A.I. aerosol.	Sprayed on twice	Do.
5. Control		Do.

[a] See footnote (a), Table I.
[b] See footnote (c), Table I.
[c] See footnote (d), Table I.

This series of experiments demonstrates that the telomer is superior to the other materials tested in preventing the adhesion of paint to wood. It was, in fact, the only successful coating.

EXAMPLE IV

A surface (steel) previously covered with a firmly adhering coat of alkyd enamel was dipped into an 11% A.I. dispersion of telomer. The surface was then covered with alkyd enamel and allowed to dry. The second coat of enamel was readily peeled away from the first coat. Without the coating of telomer, the second coat of enamel firmly adheres to the first.

After the layer of enamel had been peeled off in the above test, the protective coating was removed by brisk rubbing. Then, the surface was covered with enamel and allowed to dry. It adhered firmly to the first coat of enamel.

EXAMPLE V

Coupons of tin-coated steel, as described in Example I, were coated with various telomers of tetrafluoroethylene as described in Table IV. They were then immersed in alkyd enamel as in Example I. The results on paint adhesion are shown in Table IV.

Table IV

Telomer of TFE [a]	Application	Adhesion of Paint
1. Methylcyclohexane [b]	Dipped once	Easily removed.
2. Diethyl Phosphite 8% A.I. in $C_2F_3Cl_3$.	do	Do.
3. Methyl alcohol 7% A.I. in $C_2F_3Cl_3$.	do	Do.
4. Polysiloxane 8% A.I. in $C_2F_3Cl_3$.	do	Do.

[a] TFE=tetrafluoroethylene. The telogen is indicated.
[b] Item 2, Table I.

It is to be understood that any of the heretofore described telomers of tetrafluoroethylene may be substituted in the preceding examples to give substantially the same results. In addition, substantially identical results are achieved when lacquer is utilized instead of paint and when the material of the surface varies as described. Mixtures of the heretofore-described telomers are also operative to produce a removable coating composition as herein described.

In addition to the preceding examples utilizing telomers of tetrafluoroethylene as an antiadhesive for paint, it is also to be understood that these telomers are useful as antiadhesives for other purposes. Thus, they are useful in preventing the rubber sealing gaskets of refrigerator doors from sticking to the body of the refrigerator. They are also useful in preventing unused postage stamps and labels from sticking to each other or to other papers. They may be used to prevent materials from sticking to finishes of boats and in preventing mud from sticking to shoes. They are also useful in preventing materials from sticking to process equipment such as blenders, conveyor belts, chutes and calenders. They are also useful in preventing paint accumulation in spray booths.

An understanding of the invention will be further aided by reference to the accompanying drawing which describes the series of steps necessary to carry out the novel process of the subject invention. The process is illustrated in the drawing by showing a substrate as it would appear after each step in the series of steps which combine to form the process. The sequence in which the steps of the process are carried out follows the direction of the arrows in the drawing. With reference to the drawing, the top sketch of the substrate shows the surfaces of the substrate to be coated and the surface to be masked or protected from the coating. The next sketch depicts the substrate after the telomer masking coating has been applied to the designated surface. The wax-like telomer coating is applied to the substrate as a dispersion in a solvent. The solvent is subsequently removed by evaporation. The telomer dispersion can be applied to the surface of the substrate by any conventional means, such as by brushing or painting the dispersion on the surface, or by dispensing the dispersion from an aerosol container. The third sketch of the substrate shows the substrate after the permanently adhering surface coating has been applied to the surfaces designated to be coated. The fourth sketch of the substrate depicts the substrate during the removal of the telomer masking coating. The telomer coating can be removed by any convenient method, such as peeling or chipping the coating. Any permanently-adhering surface coating which inadvertently fell on the telomer masking coating is easily removed with the masking coating as illustrated in the drawing. The last sketch of the substrate shows the finished product with the desired surfaces coated and the adjoining surface uncoated.

This application is a continuation application of my copending application, Serial No. 15,824, filed March 18, 1960, now abandoned.

As many apparently widely different embodiments of this invention may be made without departing from the spirit and scope thereof, it is to be understood that this invention is not limited to the specific embodiments thereof except as defined in the appended claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A process which comprises coating a portion of a surface with a dispersion of a wax-like telomer of tetrafluoroethylene in a volatile solvent, said telomer having a molecular weight within the range of 1,000 to about 20,000, and allowing said solvent to evaporate thereby forming a temporary antiadhesive telomer coating on said portion of said surface, followed by applying to the adjacent non-telomer coated portion of said surface a thin layer of a permanently-adhering surface coating and allowing said surface coating to set, and thereafter removing from said surface said telomer coating and such portion of said permanently-adhering surface coating as may be applied thereon when applying said permanently-adhering surface coating.

2. A process which comprises coating a portion of a surface with a dispersion of a wax-like telomer of tetrafluoroethylene in a volatile solvent, said telomer having a molecular weight within the range of 1,000 to about 20,000, and allowing said solvent to evaporate thereby forming a temporary antiadhesive telomer coating on said portion of said surface, followed by applying to the adjacent non-telomer coated portion of said surface a layer of permanently-adhering paint and allowing said paint to harden, and thereafter removing from said surface said telomer coating and such portion of said permanently-adhering paint as may be applied thereon when applying said permanently-adhering paint.

3. The process according to claim 1, wherein said telomer of tetrafluoroethylene is prepared by telomerizing tetrafluoroethylene with diethyl phosphite in a trichlorotrifluoroethane solution.

4. The process according to claim 1, wherein said

telomer of tetrafluoroethylene is prepared by telomerizing tetrafluorethylene with methyl alcohol in a trichlorotrifluoroethane solution.

5. The process according to claim 1, wherein said telomer of tetrafluoroethylene is prepared by telomerizing tetrafluoroethylene with a polysiloxane in a trichlorotrifluoroethane solution.

6. The process according to claim 1, wherein said telomer of tetrafluoroethylene is prepared by telomerizing tetrafluoroethylene with methylcyclohexane in a trichlorotrifluoroethane solution.

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