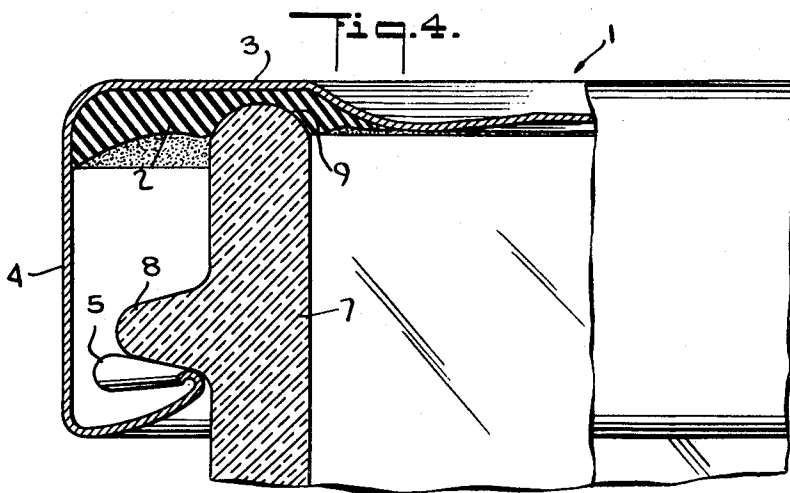
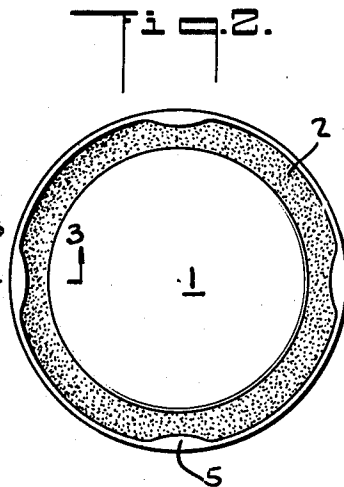
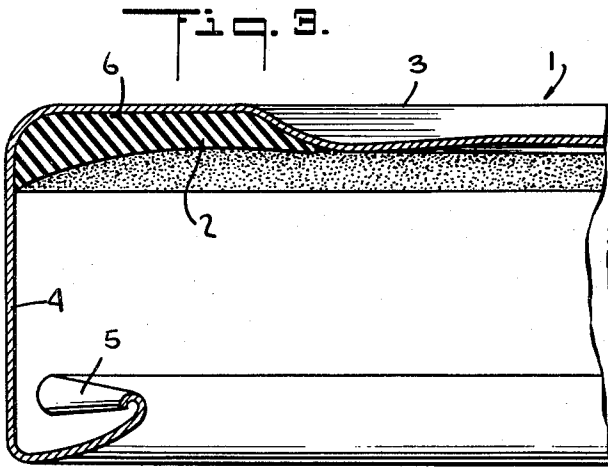
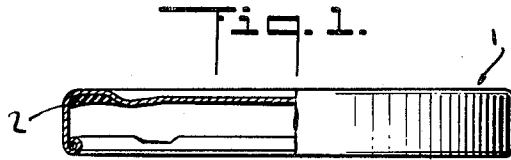


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G. J. FOSS ETAL
GASKET COMPOSITION
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GASKET COMPOSITION

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This invention relates to compounds which may be added to gasket lining compositions of the plastisol type, for the purpose of bringing within controllable limits the opening and closing torques of closures in sealing and unsealing containers.

The use of vinyl chloride resins, especially the so-called "plastisol" formulations, as gasket material to line the inside of metal closures, has developed rapidly in recent years. Such plastisol gaskets are satisfactory in many respects, and they present certain advantages over other well-known types of gaskets. Considerable difficulty, however, has resulted from the fact that the elasticity of plastisols varies substantially with changes in temperature and with the passage of time. A closure cap applied originally to a container with a proper removal torque value may become tightly "frozen" after it is stored so as to be difficult to remove by hand. On the other hand, a change in temperature may render the cap so loose as to expose its contents to loss, spoilage or contamination before they reach the consumer. Generally, it has been found that for each size of closure, there is a maximum opening torque which permits easy removal of the cap by the user, but attempts to keep the opening torques always below the desirable limits have frequently failed in the past.

An object of this invention is therefore to provide an additive which may be inserted in plastisol forming compositions for closure gaskets so as to reduce the coefficient of friction between the plastisol and a glass container and to bring the opening torque within desirable limits, regardless of the fact that the sealed container may have been stored for long periods of time and that it may have been subjected to considerable changes of temperature due to weather or other factors.

Another object of this invention is to provide a plastisol gasket additive which is not harmful to the human body, will not contaminate foods or have any objectionable odor.

Still another object of this invention is to provide a plastisol gasket additive which may easily be mixed with other plastisol forming ingredients and flowed with them into metal closure caps without the necessity of heating the composition before or during the flowing-in operation.

Other and further objects of the invention will be obvious upon an understanding of the illustrative embodiment about to be described or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

Although the specifications herein generally refer to plastisols, it is understood that other compositions of the same general types may be used with the invention, such as organosols and formulations including vinyl polymer or copolymer resins which are generally fluxed with a plasticizer to produce a rubber-like composition.

The use of lubricants in various types of gaskets for controlling the torque in sealing and removal of screw closures is known in the art and has been used commercially as described in Patent No. 1,899,821 to Parker.

The essence of the present invention lies in the discovery that acid amides used as additives in plastisol gasket compositions produce a torque control which varies only slightly as a result of changes in temperature and as

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a result of the passage of time from the time of sealing until the closure is removed. This new and improved result is highly desirable. It has been discovered that acid amides, when added to a plastisol formulation, will mix easily with it and provide a composition which may be flowed into metal caps without any previous heating.

After subsequent "fluxing" of the composition inside the cap, a satisfactory gasket results and the closure, when applied to a glass container, does not require an excessive opening torque even though subjected to unusually low temperatures such as are met under refrigerating conditions prior to removal of the closures. The tests conducted with "Armid-O," a material the composition of which is given below, were particularly successful in these respects, as it was found that the low opening torques with closures containing that compound were not adversely affected by either unusually high or low storage temperatures or by prolonged storage periods prior to opening of the container.

In practicing the invention, use was made especially of various "Armids," which are products manufactured by the Armour Chemical Division of Armour and Co., in Chicago, Illinois. These consist of acid amides, singly or in mixtures, such acid amides being generally derived from various fatty acids. For instance Armid-O is a composition containing 91% oleamide (9-octadecanamide), 6% stearamide (octadecanamide), 3% linoleamide, (9,12-octadecadienamide) by weight. A basic formula, "Formula #1," in accompanying Table I, was discovered to be particularly satisfactory. Experiments were continued, varying the proportions of Armids employed and at times also adding new compounds. The results obtained with the basic formula and variations thereof are given below:

TABLE I

Plastisol Formulas and Removal Torques

	1	2	3	4
Geon 120X3.....	60	60	60	60
Geon 202.....	40	40	40	40
Baryta White.....	50	100	-----	-----
GP-261.....	75	80	70	70
Paraplex G-62.....	5	5	5	5
Titanox 168-LO.....	5	5	5	5
Armid O.....	4	5	3	3
Aerawax C.....	-----	-----	-----	3
Removal Torques (in inch lbs.):	-----	-----	-----	-----
Hot Pack—82 mm.—	-----	-----	-----	-----
Average.....	40.2	44.2	41.5	65.0
Range.....	29-48	34-65	37-49	49-86
Hot Pack—63 mm.—	-----	-----	-----	-----
Average.....	27.2	-----	-----	-----
Range.....	24-34	-----	-----	-----

TABLE II

Plastisol Formulas and Removal Torques

	5	6	7	8	9
Geon 121.....	60	60	60	60	60
Geon 202.....	40	40	40	40	40
Baryta White.....	50	50	50	50	50
GP-261.....	75	75	75	75	75
Paraplex G-62.....	5	5	5	5	5
Titanox 168-LO.....	5	5	5	5	5
Armid O.....	4	6	4	4	4
Glycerin.....	-----	-----	1	-----	-----
Paraffin.....	-----	-----	-----	2	-----
Flexible Wax.....	-----	-----	-----	-----	2
Removal Torques (in inch lbs.):	-----	-----	-----	-----	-----
Hot Pack—82 mm.—	-----	-----	-----	-----	-----
Average.....	43.3	43.8	47.2	47.0	48.5
Range.....	41-46	41-49	46-49	43-52	43-54
Hot Pack—63 mm.—	-----	-----	-----	-----	-----
Average.....	31.5	31.8	35.7	31.7	33.3
Range.....	27-35	26-36	29-50	27-43	26-40

TABLE III

Formulas and Removal Torques

[Oleamide, stearamide, and various acid amides]

Plastisol Compound	10	11	12	13	14	15
Geon 121.....	60	60	60	60	60	60
Geon 202.....	40	40	40	40	40	40
Ohopex Q-10.....	70	70	70	70	70	70
Paraplex G-62.....	5	5	5	5	5	5
Titanox 168-LO.....	5	5	5	5	5	5
Atomized Acrawax C.....				3		
Armid HT.....	3					
Armid C.....		3				
Armid O.....			3	3		
Armid 18.....					3	
Armowax.....						3
Removal Torques:						
63 mm. Twist Caps—						
Average.....			57.2	37.8	46.8	44.8
Range.....			34-75	33-44	44-50	42-48
70 mm. Twist Caps—						
Average.....	62.2	60.8				
Range.....	52-75	51-68				

In the above tables, Geon 120X3, 121 and 202 are resins which are solvated by the plasticizer at elevated temperatures thus forming an elastic and rubbery permanent gel upon cooling. These materials are manufactured by the B. F. Goodrich Chemical Co. Baryta White is a filler which lessens the material cost of the plastisol and functions synergistically with the lubricant or lubricants employed. GP-261 is a plasticizer which solvates the resins at elevated temperatures and also gives fluidity to the unfused plastisol. Paraplex G-62 is also a plasticizer and functions as does GP-261, but it is used in these formulas primarily as a stabilizer against high temperature discoloration. It is a product of the Rohm & Haas Co. Ohopex Q-10, a product of Ohio Apex, Inc., is a plasticizer made up of a mixture of fatty, phthalic acid esters. Titanox 168-LO is a product of the Titanium Pigment Corp., a white pigment to add color to the plastisol.

Acrawax C, glycerin, paraffin and flexible wax were utilized with the acid amides in several of the formulations as illustrated in the accompanying tables. As Formula 13 in Table III indicates, Acrawax C was found to give particularly desirable results when used in conjunction with Ohopex Q-10. When utilized with GP-261, however, these various additives were not always helpful, as Table II, shows in Formulas 7, 8 and 9. Acrawax C is a hard synthetic wax manufactured by Glyco Products Company.

As has been pointed out already above, Armid-O is mostly composed of oleamide (91%), with small amounts of linoleamide and stearamide added (3% and 6%, respectively).

Armid HT mostly consists of stearamide (75%) with 22% of palmitamide (hexadecanamide) and 3% oleamide also entering the composition.

Armid C is a composition consisting of 49% lauramide (dodecanamide), 17% myristamide (tetradecanamide), 9% palmitamide, 8% caprylamide (octanamide), 7% capramide (decanamide), 6% oleamide, and 2% each of stearamide and linoleamide.

Armid 18 is a composition made up almost entirely of stearamide (93%) with 5% palmitamide, and 2% oleamide added.

Armowax is the Armour Chemical Division's trademark for methylene bis-stearamide.

The preparation of the composition described in Formula #1 is typical of the others and is accomplished as follows: all of the ingredients are blended together except for one third of the plasticizer, until the resins are thoroughly dispersed. The remaining one third of the plasticizer is then added and also thoroughly dispersed. To facilitate the incorporation of the acid amide additive in the plastisol, it is melted in the plasticizer. The mixture is then cooled to at least 90° F. prior to the blending in of other ingredients. With the exception of melting the

acid amide additive, all operations of compound mixing and lining of caps, are performed at room temperature (80°-90° F.). Thus the temperature of the plastisol composition need at no time be raised above room temperature except for cold winter days when it may be necessary to raise the plastisol temperature to 80° F. This temperature rise may be facilitated by agitation.

A typical closure cap for use with the gasket compounds of the invention has been chosen for purposes of illustration and description and is shown in the accompanying drawings forming a part of the specification, wherein:

FIG. 1 is a side elevational view partially in section of a typical closure cap for use with the gasket compounds of the invention;

FIG. 2 is a bottom plan view of the closure cap of FIG. 1;

FIG. 3 is a sectional view of the closure cap taken along lines 3-3 of FIG. 2; and

FIG. 4 is a sectional view corresponding to FIG. 3 showing the closure cap applied to a container with the closure gasket compound in sealing engagement with the rim of the container.

The gasket compounds of this invention, having acid amide lubricants to control the slippage of gaskets on sealing surfaces, are suitable for the various types of closures utilizing gaskets, including threaded caps, interrupted thread caps, and lug-type caps. In FIGS. 1 through 4 the gasket compound is applied to a well known lug-type closure 1 to form a sealing gasket 2 therein. This typical closure 1 has a metal shell with a cover 3 and a depending skirt 4 having container engaging lugs 5 formed at its lower edge. An annular channel 6 is provided adjacent the periphery of the cover 3 to receive the gasket compound which may be flowed into the channel 6 or otherwise applied. When the closure 1 is applied to the container 7, the lugs 5 are threaded into engagement with cooperating threads or lugs 8 on the container 7 and the gasket 2 is drawn into sealing engagement with the container finish 9 as illustrated in FIG. 4. The gasket compounds of the invention with the acid amide lubricants fix the removal torque within predetermined limits as the closure 1 is removed from the container 7 by controlling the friction forces between the closure finish 9 and the contacting surface of the gasket 2. The acid amides are included in sufficient amounts as illustrated in the formula tables so that the friction reducing effects of the lubricants are obtained on the surface of the gasket 2 which is in contact with the closure finish 9.

It will be seen that by the present invention as expressed in the formulas in the foregoing charts, gasket forming compositions are produced which, because of the use of acid amides as torque controlling agents, are eminently satisfactory for use in closures for both bottles and jars, and because of the extreme simplicity of their application as well as the excellent results obtained, represent an advance over the prior art in comparable gasket formulations. In effect, the acid amide additives will "bloom" to the surface of the plastisol composition, and thereby provide the lubrication necessary so as to obtain the torque control required by the objects of the present invention.

As various changes may be made in the form, construction, and arrangement of the parts herein without departing from the spirit and scope of the invention, and without sacrificing any of its advantages, it is to be understood that all matter herein is to be interpreted as illustrative and not in a limiting sense.

Having thus described our invention, we claim:

1. A container sealing closure to be applied and removed by rotation of the closure about an axis perpendicular to the plane of the opening of the container, carrying on its inner surface a gasket comprising a thin layer of a sealing composition comprising a plastic matrix of a vinyl polymer and an amount of a plasticizer there-

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for sufficient to form a plastisol and including a minor proportion of a torque control agent uniformly distributed therein, said torque control agent including at least one long chain aliphatic carboxylic acid amide.

2. The closure of claim 1, in which the amount of the torque control agent is between about 1.6% and about 2.5% by weight of the plastisol. 5

3. The closure of claim 1, in which the torque control agent is predominantly oleamide, in admixture with minor amounts of stearamide and linoleamide. 10

4. The closure of claim 1, in which the torque control agent is predominantly stearamide, in admixture with minor amounts of palmitamide and oleamide.

5. The closure of claim 1, in which the torque control agent is predominantly lauramide, in admixture with minor amounts of myristamide, palmitamide, caprylamide, capramide, oleamide, stearamide, and linoleamide. 15

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6. The closure of claim 1, in which the torque control agent consists essentially of about 91% oleamide, 6% stearamide, and about 3% linoleamide, by weight.

References Cited in the file of this patent

UNITED STATES PATENTS

2,464,855	Duggan et al.	Mar. 22, 1949
2,880,901	Zipper et al.	Apr. 7, 1959

FOREIGN PATENTS

810,786	Great Britain	Mar. 25, 1959
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OTHER REFERENCES

26 "Chem. & Eng. News," page 2205, advertisement, July 26, 1948.