

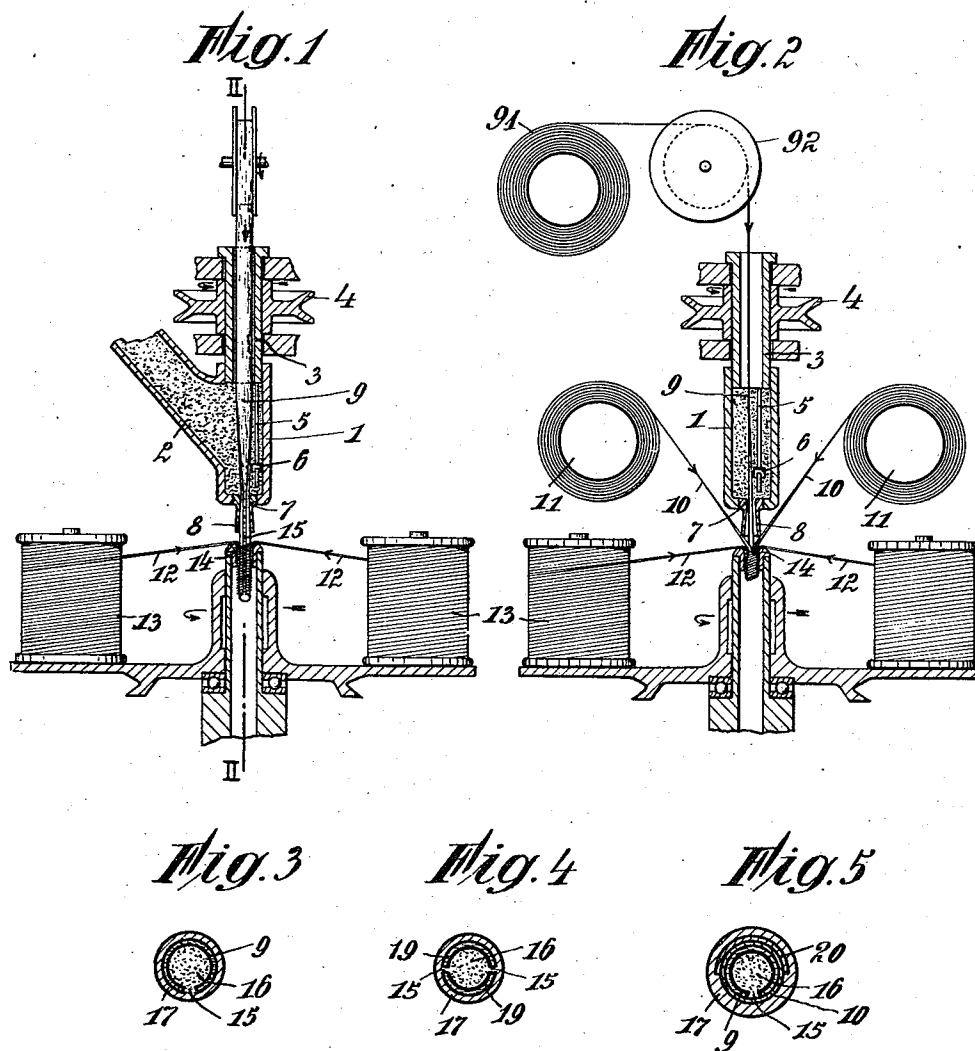
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SAFETY FUSE

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SAFETY FUSE.

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My invention relates to safety fuses of that class comprising a core consisting of a substance capable of comparatively slowly burning without the access of external air, a wrapper of paper or similar thin flexible material little pervious to gases and a filament covering consisting of yarn or wires or both surrounding such wrapper.

Various methods of manufacturing such fuses have been proposed in which a strip of paper or similar material is caused to pass along with the granular or pulverulent core material through a nozzle, the filament covering being applied to the wrapper after it has left the nozzle in some suitable manner such as plaiting or rope laying.

With these old methods in which the strip from which the wrapper is formed has a greater width than the inner periphery of the nozzle through which the wrapper passes along with the core, certain difficulties arise in practice. The nozzle being comparatively narrow, the wrapper strip is liable to crimp and fold while it moves towards the nozzle and is at the same time bent transversely so that the edges of the strip do no more smoothly overlap each other and fit the inner periphery of the nozzle, but the strip is folded inwards with the result that the core becomes irregular in transverse section and local excesses of pressure in such parts of the core may occur.

This not only interferes with the manufacture on account of frequent breakage of the wrapping strip and choking of the nozzle, but also results in irregularities of the burning of the core which in safety fuses may prove fatal.

The object of my invention is to avoid these difficulties and to provide an improved safety fuse and a process whereby safety fuses of this class may be safely, cheaply and readily manufactured and whereby a safety fuse is obtained in which the transverse section of the core is uniform throughout and in which local excesses of pressure are avoided so that the safety fuse will reliably burn with uniform speed.

With these objects in view my invention consists in making the wrapper of one or more strips the width or sum of widths of which is less than the outer periphery of the

core. I thus obtain a safety fuse in which the wrapper is provided with one or more slots extending throughout the entire length of the safety fuse. In some cases it may be preferred to enclose the wrapper in a sheath consisting of one or more strips extending longitudinally throughout the entire length of the safety fuse the edges of such sheath strips overlapping each other.

I shall now describe my invention in detail with reference to the annexed drawing illustrating a machine suitable for carrying into practice my improved method and a safety fuse obtained thereby, but I wish it to be understood that I illustrate the said machine only for the purpose of facilitating the understanding of my invention of which this machine does not form part.

Fig. 1 is a longitudinal central section of a machine suitable for carrying my invention into practice,

Fig. 2 is a section on the line II II Fig. 1, Figs. 3, 4 and 5 are transverse sections of safety fuses obtained by my improved method.

In Figs. 1 and 2, 1 is a hopper to which the granular or pulverulent core mass is supplied by a chute or by any suitable means. A hollow cylinder 3 is revolvably mounted on the hopper and adapted to be operated by a pulley 4 from any source of power not shown. Stirring rods 5 extend from the cylinder 3 into the hopper. Stirring blades are mounted on the rods 5. A nozzle 7 is provided at one end of the hopper, the outer end 8 of the nozzle being slightly divergent. A wrapper strip 9 is made of paper or other suitable material practically impervious to gases and is supplied from a supply roller not shown. Sheath wrappers are supplied from supply rolls 11. Yarns or wires 12 are supplied from supply rolls 13 revolving around the nozzle 7. A guide 14 is provided for the safety fuse having wound thereon or plaited round it the yarns or wires.

The width of the wrapper strip 9 is less than the inner periphery of the nozzle 7. Instead of one strip 9 I may use a plurality of the wrapper strips the sum of the widths of which is less than the interior periphery of the nozzle. The paper strip 9 may be im-

pregnated with a suitable substance such as nitrate for facilitating its ignition and burning. If now the wrapper strip or strips are pulled through the hollow cylinder 3 and the hopper 1 towards the nozzle they have a tendency to take with them the core mass in the hopper 1. At the same time they are gradually bent transversely so as to form a trough into which the granular or pulverulent core mass contained in the hopper enters. As the trough formed by the wrapper strip is more and more closed it would have a tendency to compress the core mass. But this tendency is counteracted by the fact that the trough so formed by the wrapper strip is open at one side so that any excess of the core mass can freely escape. This continues up to the nozzle itself where the wrapper strip forms the longitudinal slot 15 owing to the fact that the width of the wrapper strip is less than the inner periphery of the nozzle. Should for any reason the escape of the core mass from the said trough be impeded, then the divergent outer part 8 of the nozzle will permit the core mass contained in the wrapper strip to expand whereby any local excess of pressure on the core mass is efficiently obviated. The operation would be exactly the same if instead of one wrapper strip a plurality of such strips were used, the sum of the widths of the individual strips being less than the inner periphery of the nozzle. The wrapper after passing through the nozzle has one or more longitudinal slots such as 15 according to the number of individual strips constituting the wrapper. Some classes of core mass have a tendency to settle under some pressure and thereby to offer an undesirable resistance to the forcing out of the core mass through the slot or slots in the wrapper. In such cases I provide the stirring bars 5 and stirring blades 6 which while revolving with the hollow cylinder 3 stir and thereby loosen the core mass in the hopper 1. In some cases I prefer to enclose the core and the wrapper provided with one or more longitudinal slots such as 15 in a sheath of paper or other material practically impervious to gases. This can be done by sheath strips 10 supplied by supply rolls 11 and pulled along with the safety fuse through the guide 14 and overlapping each other. But in many cases such sheath may be dispensed with.

After the safety fuse with the longitudinally slotted wrapper 9 has left the nozzle and has been provided, if desired, with the sheath strips 10, yarn or wire or some other filament covering, is mounted on the wrapper or sheath as the case may be. This may be done by winding round the wrapper or sheath threads or wires 12 supplied from bobbins 13 rotatably mounted on a disc revolving around the nozzle or in any other known or preferred manner.

I have found by extensive experiment that the method above described results in safety fuses of very good quality and fully obviates the difficulties above referred to even with core mass which are difficult to deal with in any of the methods of manufacturing safety fuses heretofore known. I have also found that my improved safety fuses possess certain marked advantages as to uniformity of burning and reliability even after being subjected to compression or distortion.

Fig. 3 shows a transverse section of my improved safety fuse consisting of the core 16, the wrapper 9 having a single longitudinal slot 15 and a filament covering 17. In Fig. 4 a similar fuse is shown in which two wrapping strips 19, 19 are used which are separated from each other by longitudinal slots 15. Fig. 5 shows a transverse section of a safety fuse consisting of a core 16, a wrapper 9 having a longitudinal slot 15 a sheath consisting of two sheath strips 10, 20 the edges of which overlap each other and a filament covering 17.

What I claim is:

1. A safety fuse consisting of a core capable of burning at a comparatively low speed without the access of external air, in combination with a wrapper of at least one strip of a thin flexible material, said wrapper being provided with at least one slot extending throughout the entire length of the safety fuse, and a filament covering surrounding said wrapper.
2. A safety fuse consisting of a core capable of burning at a comparatively low speed without the access of external air, in combination with a wrapper of at least one strip of a thin flexible material said wrapper being provided with at least one longitudinal slot extending throughout the entire length of the safety fuse, a sheath of thin flexible material on the said wrapper extending throughout the length of the safety fuse, and a filament covering surrounding said sheath.
3. A safety fuse consisting of a core capable of burning at a comparatively low speed without the access of external air, in combination with a wrapper of at least one strip of paper, said wrapper being provided with at least one slot extending throughout the entire length of the safety fuse, and a filament covering surrounding the wrapper.
4. A safety fuse consisting of a core capable of burning at a comparatively low speed without the access of external air, in combination with a wrapper of at least one strip of a thin flexible material, said wrapper being provided with at least one slot extending throughout the entire length of the safety fuse, a sheath of paper on the said wrapper and extending throughout the length of the safety fuse, and a filament covering surrounding said sheath.

5. A safety fuse consisting of a core capable of burning at a comparatively low speed without the access of external air, in combination with a wrapper of at least one strip of paper impregnated with a substance facilitating its ignition and burning, said wrapper being provided with at least one slot extending throughout the entire length of the safety fuse, and a filament covering surrounding said wrapper. 10

In testimony whereof I have affixed my signature.

JOHANNES FRITZSCHE.