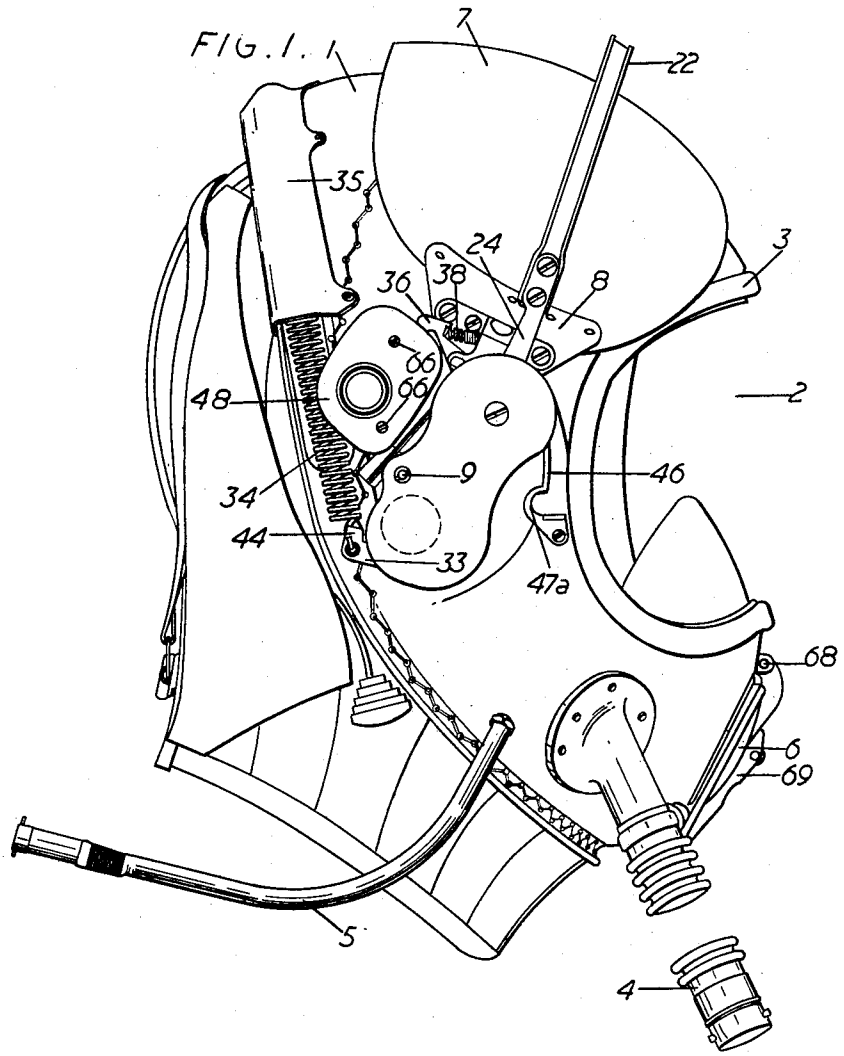
April 14, 1964 M. J. O. LOBELLE 3,128,469

FLYING HELMETS

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FIG. 1.



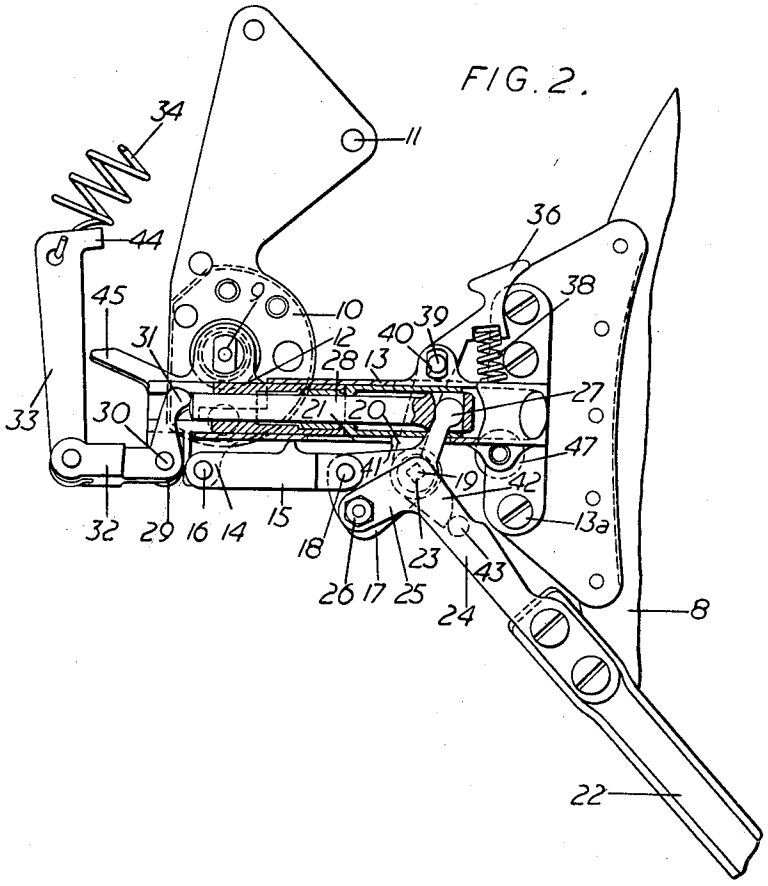
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FIG. 2.



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FIG. 3.

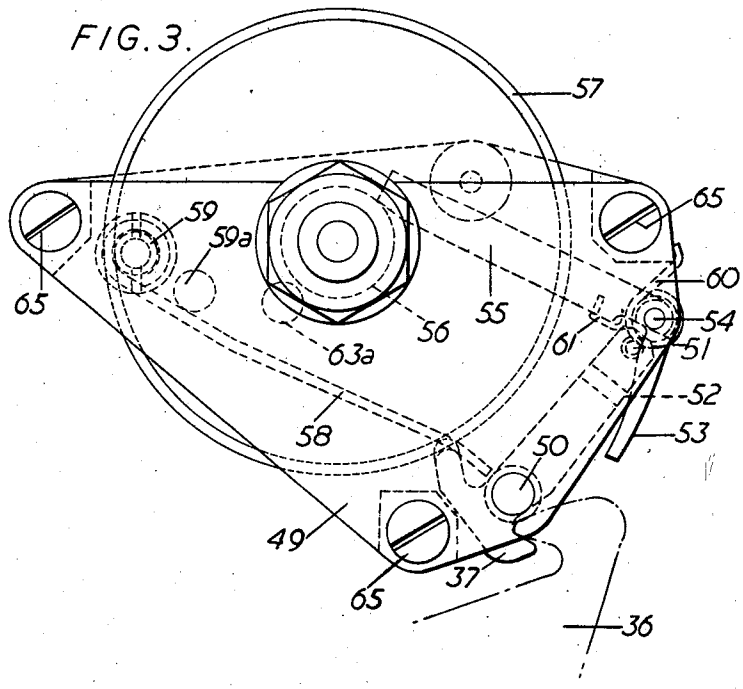
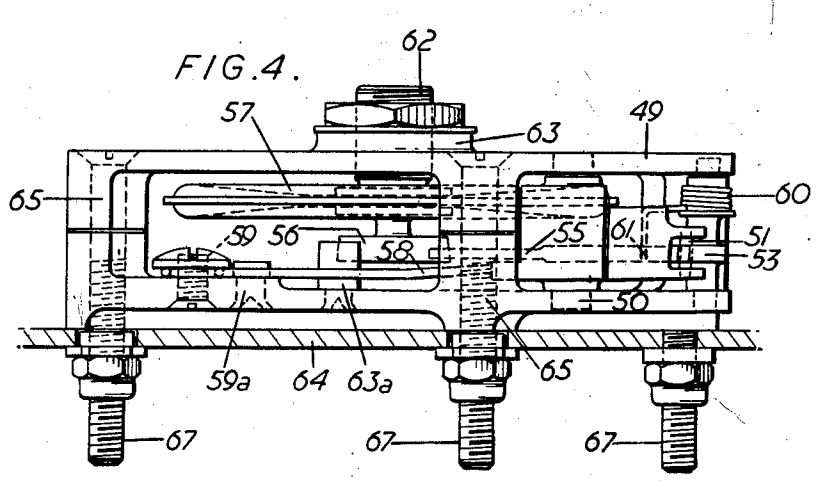


FIG. 4.



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3,128,469

FLYING HELMETS

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4 Claims. (Cl. 2—6)

This invention relates to pressurized helmets, which are used, together with pressurized flying suits, by the crews of military aircraft in emergencies when the pressurization of the cabin of the aircraft fails.

The term pressurized helmet as used throughout the specification and claims is intended to include helmets of this sort whether or not the pressure in the helmet is actually held above that of the surroundings.

Such helmets have a rigid shell which extends over the face and the top of the head of the wearer. In order that the wearer is not too restricted when the helmet is not pressurized, an opening is provided in the shell in front of the wearer's eyes. This opening must of course be closed and sealed to enable the helmet to be pressurized, and for this purpose a transparent visor is provided.

The visor is mounted on a pair of side arms on the outside of the shell so that it can swing from an open position above the opening where it is held by a spring loaded catch to a lower position in which it closes the opening. The movement from the open to the closed positions is effected by a spring or springs which also hold the visor down in its closed position. To maintain an adequate seal between the visor and the edge of the shell around the opening, it is necessary to press the visor rearwardly against the outside of the shell. One way of doing this, is by including springs in the side arms. It has been found, however, that to keep the bulk of the side arms within reasonable limits, only comparatively small springs can be fitted to them, and these springs are not sufficient to maintain an adequate force on the visor.

According to the present invention, the visor is urged into a closed position by springs, one acting on each side arm, and extending from the back of the respective side arm up the sides of the shell, each spring also acting through linkages connected to the visor to pull the visor rearwardly against the shell when the visor is in its closed position to seal the opening in the shell.

Since the springs extend up the sides of the rigid shell, their sizes are little restricted, and the springs may therefore be made sufficiently powerful to produce any downward and rearward force on the visor which is necessary to close it and to maintain an adequate seal against the internal pressure acting on the visor when the helmet is pressurized.

Preferably each linkage is a toggle linkage which acts so that when straightened out by the respective springs it locks the visor rigidly in its rearmost position. The visor is thus held against release by inadvertent movement even if this movement is a forward thrust on the visor itself. It is important that the visor can be operated easily and preferably an operating bar extends between the two side arms and is connected at each side to the pivot of the respective toggle linkage so that when the operating bar is moved upwards to open the visor the toggle linkages are collapsed thus moving the visor forwards against the action of the springs. The bar thus performs the function of unlocking the visor when in its closed position and it is also preferably connected by a linkage to the spring loaded catch which holds the visor in its open position. Thus by moving the operating bar downwardly when the visor is open, the catch is released and the closing movement initiated. This movement may alternatively be

started by connecting the catch through a further linkage to a barometric capsule which acts to release the catch when the pressure acting on the capsule falls below a set value.

When moving the visor into the closed position the springs are also exerting a rearward force on it and the visor is preferably provided at each side with rollers which run on tracks on the outer surface of the shell. These tracks are formed at their lower parts with rearwardly extending notches so that when the visor reaches the closed position the rollers engage the notches thus allowing the springs to pull the visor into its rearward position.

A helmet according to the invention will now be described in more detail by way of example with reference to the accompanying drawings in which

FIGURE 1 is a side view of the helmet;

FIGURE 2 is a side elevation partly in section of the linkage between the spring and the visor;

FIGURE 3 is a side elevation of the barometric capsule; and FIGURE 4 is a plan of the barometric capsule.

Referring now to FIGURE 1, the helmet consists of a rigid shell **1** moulded out of a glass fibre reinforced plastic material and having an opening **2** in front of the wearer's eyes. The sides of this opening are surrounded by a rubber tyre **3** having small holes (not shown) on its inner surface which communicate with the interior of the helmet so that the pressure in the tyre is provided by the oxygen pressure within the helmet. The bottom of the rigid shell has the usual oxygen inlet **4** and emergency oxygen pipe **5** connected to it, and is also fitted with a flap **6** for closing an opening provided in front of the wearer's mouth. A visor **7** shown in the open position in FIGURE 1, is mounted on a pair of side arms **8** pivoted to the rigid shell of the helmet at **9**. The visor has dimensions such that when in the closed position shown in FIGURE 2 it completely covers the opening **2** and bears against the tyre **3**. Each side arm is actually pivoted on a bracket **10** which is fixed to the rigid shell of the helmet by rivets such as **11**.

Each side arm comprises two telescopically arranged tubular parts, the inner part **12** being pivoted on the bracket **10** and outer part **13** being rigidly connected to the visor by screws such as **13***a*. The visor can thus move along the side arm relatively to the pivot. The rear end of the outer telescopic part **13** carries a lug **14** to which one member **15** of a toggle linkage is pivoted at **16**. The second member **17** of this toggle linkage is pivoted to the first at **18** and is also pivoted at **19** onto a further lug **20** projecting from the inner telescopic part **12** through a slot **21** in the surface of the outer telescopic part. When the toggle linkage is straight as is shown in FIGURE 2 the first lug and thus the outer telescopic part and visor are moved to their extreme rearward position and when the linkage is collapsed the lug **14** moves towards the lug **20** so that the visor is moved forwards.

Extending between the two side arms is an operating bar **22**, each end of which is in the form of a bell crank lever, the junction of the arms of which is pivoted on the lug **20** at **23**. One arm **24** of the bell crank lever is formed by the end of the operating bar itself and the other arm **25** has a bolt, the head of which is shown at **26** and the shaft of which passes through an arcuate slot (not visible in the drawings) in the link **17**. This allows slight movement of the operating bar before it actually controls the toggle linkage.

The link **17** also carries an arm **27** which extends through the slot **21** in the outer telescopic part and lies immediately in front of a sliding plunger **28** which can move inside the inner telescopic part **12**. The rear end of the inner telescopic part carries a further lug **29** to which another bell crank lever is pivoted at **30**. One arm **31** of this bell crank lever bears against the rear end

of the sliding plunger 28 and the other arm 32 is connected by a link 33 to a spring 34. The spring 34, as is shown in FIGURE 1, extends up the side of the rigid shell of the helmet and is protected part of the way by a casing 35. Thus, it will be seen that the spring 34, acting through the bell crank pivoted at 30, the plunger 38 and arm 27, urges the toggle linkage toward the position shown in FIGURE 2 to pull the visor rearwardly. Also, it will be understood that a mechanism identical to that just described is provided on both sides of the helmet.

When the visor is in its open position it is held there by a catch 36 engaging a latch 37 and forced into engagement with the latch by a compression spring 38. The catch 36 is pivoted at 39 on a lug 40 projecting from the side arm, and is formed with a downward projection 41 having a cam surface 42 at its lower end. The cam surface is engaged by a roller 43 mounted on the operating bar so that when the operating bar is pulled down to close the helmet the roller bears on the cam surface thus rocking the catch back against the compression spring and releasing it from the latch allowing the springs 34 to pull the visor into the closed position.

It has already been mentioned that when in the closed position the visor is locked there by the toggle linkage. To re-open the visor the operating lever must be moved upwards thus breaking the toggle linkage so that the visor is moved forwards and the plunger 28 is moved rearwards by the arm 27. The rearward movement of the plunger rotates the bell crank lever pivoted at 30 in an anti-clockwise direction as seen in FIGURE 2 and this stretches the side springs 34.

The collapsing of the toggle linkage and consequent stretching of the side springs continues until a projection 44 on the link 33 comes into contact with a stop 45 projecting from the rear end of the telescopic part 12. When this happens the plunger cannot move any further relative to the side arm and the whole linkage is thus locked. Further upward movement of the operating bar will then cause the side arm and the associated linkage and the visor to swing as a single unit upwards about the pivot 9. This upward movement will continue until the catch 36 engages the latch 37 to hold the visor in the open position. The manner in which the projection 34 engages the stop 45 effects a variation in the length of the moment arm through which the spring 34 operates for different positions of the visor. For example, when the visor is raised, the moment arm is shortened by the projection 44 engaging the stop 45. When, however, the visor is lowered, the projection 44 disengages the stop 45 and the spring force is transmitted directly to the bell crank arm 32 thereby increasing the moment arm through which the spring operates to pull the visor rearwardly by the toggle linkage as aforementioned.

When the visor is being moved between its two positions the springs 34 will still exert a rearward force on it and this of course must be resisted until the visor reaches the closed position. To achieve this a semi-circular track 46 is mounted at each side of the rigid shell of the helmet and a roller 47 on each side arm runs along the respective track. At its lower end each track ends in a rearwardly extending notch 47*a* into which the roller may pass thus allowing the visor to be pulled back firmly against the tyre 3, thus completely sealing the opening in the front of the helmet.

The closing of the visor can be initiated by the operating bar as already mentioned or by a barometric capsule and associated series of linkages fixed to the side of the helmet and protected by a cover plate 48. This mechanism is shown in more detail in FIGURES 3 and 4. The latch 37 with which the spring loaded catch 36 engages to hold the visor open, is pivoted on a plate 49 at 50. The end of the latch on the opposite side of the pivot carries a pin 51 which bears against a cam surface 52 formed on one arm 53 of a bell crank lever pivoted on the plate 49 at 54. The other arm 55 of this bell crank lever rests on a collar 56 fixed to a barometric capsule 57. The latch 37 is biased into the position shown in FIGURE 3 by a light wire spring 58 fixed to the plate 49 by a screw 59 and bearing against a stop 59*a*. The bell crank lever is also biased into the position shown in FIGURE 3 by a light torsion spring 60 encircling the pivot 54 and bearing at one end on the plate 49 and at the other end 61 on the arm 55 of the bell crank lever. When the visor is in the open position there is a downward force on the catch 36 due to the springs 34 and this force will tend to turn the latch in a clockwise direction thus moving the pin 51 down the cam surface 52 to rock the bell crank lever in an anti-clockwise direction. Such movement however is resisted since the arm 55 is in engagement with the collar 56.

If, however, the air pressure acting on the barometric capsule 57 is suddenly decreased to a set amount, the capsule will expand and move the collar 56 from under the lever 55 thus allowing it to move in an anti-clockwise direction and thus release the catch to allow the visor to close. After the release of the catch both the bell crank lever and the latch are urged back to their original positions by the springs 60 and 58 respectively. The mechanism, however, is not fully reset until the barometric capsule has once again contracted and moved the collar 56 under the arm 55. Thus the visor owing to lack of rigid support for the catch cannot be made to remain open even if deliberately raised until the ambient air pressure corresponds to that of a safe altitude.

The capsule 57 is mounted on a screw threaded spigot 62 passing through a boss 63 on the plate 49. By rotation of the spigot the capsule can thus be adjusted to a required distance from the plate 49 up to a limit defined by a stop pin 63*a*. Thus the distance of the collar over which the lever 55 has to travel before leaving the collar can be adjusted and this in effect acts as an adjustment of the pressure at which the visor is automatically closed. The plate 49 is fixed to a base plate 64 by screws 65 and the cover 48 is fixed to plate 49 by screws 66. The base plate 64 is provided with bolts such as 67 which pass through the fibre glass shell of the helmet to fix the assembly in place. The ends of these bolts are, of course, well padded to prevent possible injury to the wearer's head. It has been mentioned that similar side arm mechanisms are provided at each side of the helmet; however, the catch 36 and its associated manual and automatic release mechanisms are only provided at one side of the helmet.

If an emergency occurs and the cabin pressure falls rapidly, it is possible that the wearer of the helmet may have the mouth flap 6 open. In fact in normal constructions this flap is held open by a torsion spring passing round the pivot 68 of the flap. To provide automatic closing and sealing of the flap the dimensions of it and the operating bar 22 are made such that when the operating bar descends it contacts a raised portion 69 of the flap and moves it down to a position in which two spring loaded plungers (not shown in the drawing) engage recesses in the shell of the helmet to hold the flap closed and sealed. This operation of course occurs whether closing of the visor is manual or automatic.

I claim:

1. A helmet capable of being pressurized and including: a rigid shell having a front opening; a visor for closing said opening; a pair of side arm assemblies one on each side of said shell, each said side arm assembly comprising: an inner tubular member having a front end and a rear end and having a slot therethrough toward said front end; means pivotally mounting said inner tubular member to said shell near said rear end; an outer tubular member concentric with and surrounding said inner tubular member and axially movable thereon, said outer tubular member having a front end and a rear end and having a slot therethrough toward said front end; means fixing said visor to said front end of said outer tubular member; a

plunger mounted within and slidable with respect to said inner tubular member, said plunger having a front end and a rear end; a toggle linkage comprising first and second toggle members each of said toggle members having a front end and a rear end; means pivotally mounting said rear end of said first toggle member to said outer tubular member near said rear end of said outer tubular member; means pivotally connecting said front end of said first toggle member to said rear end of said second toggle member; means pivotally mounting said front end of said second toggle member to said inner tubular member near said front end of said inner tubular members; means projecting from said front end of said second toggle member through said slots in said inner and outer tubular members and into contact with said front end of said plunger; a bell crank lever having first and second arms; means pivoting said bell crank lever to said inner tubular member whereby said first arm of said bell crank lever bears on said rear end of said plunger; and a link having first and second ends, and means pivoting said first end of said link to said second arm of said bell crank lever; tension spring means at each side of said helmet and each connected to said second end of said link of said side arm assembly at that side of said shell and extending from said link up that side of said shell, said tension spring means thus acting on said visor through said side arm assemblies to bias said visor to a closed position and to urge said visor rearwardly; a spring loaded catch mounted on said shell to hold said visor in said open position; a pair of tracks fixed to said shell, said tracks having arcuate upper parts and rearwardly extending notches at their lower parts; and a pair of rollers, one mounted on each side of said visor and each running on one of said tracks whereby the action of said spring means to urge said visor rearwardly is resisted by the cooperation of said tracks and said rollers while said visor is lowered, and as said visor reaches said closed position, said rollers are received in said rearwardly extending notches to remove said resistance, said side arm assemblies operating to magnify the force of said spring means to pull said visor rearwardly against said shell so that said visor makes tight sealing contact with the sides of said opening in said shell; an operating bar extending between said side arm assemblies at each side of said helmet across the width of said helmet, said operating bar having two similar ends, means pivoting each end of said operating bar to said inner tubular member of the respective side arm assembly, coaxially with said means pivotally mounting said front end of said second toggle member to said inner tubular member, a lug on each end of said operating bar extending beyond said operating bar pivoting means, means connecting said lug to said second toggle member so that as said operating bar is moved upwards to open said visor, said toggle linkages are collapsed whereby further upward movement of said operating bar moves said visor forward against the force of said spring means until said rollers move out of said rearwardly extending notches, and upon further upward movement of said operating bar said rollers engage with arcuate parts of said tracks, said helmet being moved against the force of said springs to said open position.

2. A helmet according to claim 1 including a further linkage between said operating bar and said spring loaded catch so that as said operating bar is moved downwardly from its uppermost position, said catch is moved against its spring and released so that said visor may be moved to said closed position under action of said spring means.

3. A helmet capable of being pressurized and including: a rigid shell having a front opening; a visor for closing said opening; a pair of side arm assemblies one on each side of said shell, each said side arm assembly comprising: an inner tubular member having a front end and a rear end and having a slot therethrough toward said front end; means pivotally mounting said inner tubular member to said shell near said rear end; an outer tubular member concentric with and surrounding said inner tubular member and axially movable thereon, said outer tubular member having a front end and a rear end and having a slot therethrough toward said front end; means fixing said visor to said front end of said outer tubular member; a plunger mounted within and slidable with respect to said inner tubular member, said plunger having a front end and a rear end; a toggle linkage comprising first and second toggle members, each of said toggle members having a front end and a rear end; means pivotally mounting said rear end of said first toggle member to said outer tubular member near said rear end of said outer tubular member; means pivotally connecting said front end of said first toggle member to said rear end of said second toggle member; means pivotally mounting said front end of said second toggle member to said inner tubular member near said front end of said inner tubular member; means projecting from said front end of said second toggle member through said slots in said inner and outer tubular members and into contact with said front end of said plunger; a bell crank lever having first and second arms; means pivoting said bell crank lever to said inner tubular member whereby said first arm of said bell crank lever bears on said rear end of said plunger; and a link having first and second ends, and means pivoting said first end of said link to said second arm of said bell crank lever; tension spring means at each side of said helmet and each connected to said second end of said link of said side arm assembly at that side of said shell and extending from said link up that side of said shell, said tension spring means thus acting on said visor through said side arm assemblies to bias said visor to a closed position and to urge said visor rearwardly; a spring loaded catch mounted on said shell to hold said visor in said open position; a barometric capsule mounted on said shell; a lever system connecting said capsule to said catch so that as the pressure acting on said capsule falls below a set value, said catch is released to allow said visor to close; a pair of tracks fixed to said shell, said tracks having arcuate upper parts and rearwardly extending notches at their lower parts; and a pair of rollers one mounted on each side of said visor and each running on one of said tracks whereby the action of said spring means to urge said visor rearwardly is resisted by the cooperation of said tracks and said rollers while said visor is lowered and as said visor reaches said closed position, said rollers are received in said rearwardly extending notches to remove said resistance, said side arm assemblies operating to magnify the force of said spring means to pull said visor rearwardly against said shell so that said visor makes tight sealing contact with the sides of said opening in said shell; an operating bar extending between said side arm assemblies at each side of said helmet across the width of said helmet, said operating bar having two similar ends, means pivoting each end of said operating bar to said inner tubular member of the respective side arm assembly, coaxially with said means pivotally mounting said front end of said second toggle member to said inner tubular member, a lug on each end of said operating bar extending beyond said operating bar pivoting means, means connecting said lug to said second toggle member so that as said operating bars move upwards to open said visor, said toggle linkages are collapsed whereby further upward movement of said operating bar moves said visor forward against the force of said spring means until said rollers move out of said rearwardly extending notches, and upon further upward movement of said operating bar said rollers engage said arcuate parts of said tracks, said helmet being moved against the force of said springs to said open position.

4. A helmet capable of being pressurized and including: a rigid shell having a front opening; a visor for closing said opening; a pair of side arm assemblies one on each side of said shell, each side arm assembly comprising: an inner tubular member having a front end and a rear end; means pivotally mounting said inner tubular member to said shell near said rear end; an outer tubular

member concentric with and surrounding said inner tubular member and axially movable thereon, said outer tubular member having a front end and a rear end and having a slot therethrough toward said front end; means fixing said visor to said front end of said outer tubular member; a plunger mounted within and slidable with respect to said inner tubular member, said plunger having a front end and a rear end; a toggle linkage comprising first and second toggle members, each of said toggle members having a front end and a rear end; means pivotally mounting said rear end of said first toggle member to said outer tubular member near said rear end of said outer tubular member; means pivotally connecting said front end of said first toggle member to said rear end of said second toggle member; means pivotally mounting said front end of said second toggle member to said inner tubular member near said front end of said inner tubular member; means projecting from said front end of said second toggle member through said slots in said inner and outer tubular members and into contact with said front end of said plunger; a bell crank lever having first and second arms; means pivoting said bell crank lever to said inner tubular member whereby said first arm of said bell crank lever bears on said rear end of said plunger; and a link having first and second ends, and means pivoting said first end of said link to said second arm of said bell crank lever; tension spring means at each side of said helmet and each connected to said second end of said link of said side arm assembly at that side of said shell, said tension spring means thus acting on said visor through said side arm assemblies to bias said visor to a closed position and to urge said visor rearwardly; a spring loaded catch mounted on said shell to hold said visor in said open position; a pair of tracks fixed to said shell, said tracks having arcuate upper parts and rearwardly extending notches at their lower parts; and a pair of rollers, one mounted on each side of said visor and each running on one of said tracks whereby the action of said spring means to urge said visor rearwardly is resisted by the cooperation of said tracks and said rollers while said visor is lowered and as said visor reaches said closed position, said rollers are received in said rearwardly extending notches to remove said resistance, said side arm assemblies operating to magnify the force of said spring means to pull said visor rearwardly against said shell so that said visor makes tight sealing contact with the sides of said opening in said shell; an operating bar extending between said side arm assemblies at each side of said helmet across the width of said helmet, said operating bar having two similar ends, means pivoting each end of said operating bar to said inner tubular member of the respective side arm assembly, coaxially with said means pivotally mounting said front end of said second toggle member to said inner tubular member, a lug on each end of said operating bar extending beyond said operating bar pivoting means, means connecting said lug to said second toggle member so that as said operating bars move upwards to open said visor, said toggle linkages are collapsed whereby further upward movement of said operating bar moves said visor forward against the force of said spring means until said rollers move out of said rearwardly extending notches, and upon further upward movement of said operating bar said rollers engage said arcuate parts of said tracks, said helmet being moved against the force of said springs to said open position; said helmet also being provided with a mouth flap; means pivoting said mouth flap to said shell; further spring means surrounding said pivot means and urging said flap to an open position; and a raised portion of said flap for engagement by said operating bar as it is lowered, so that as said visor is closed and sealed, said flap is also closed and sealed.

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