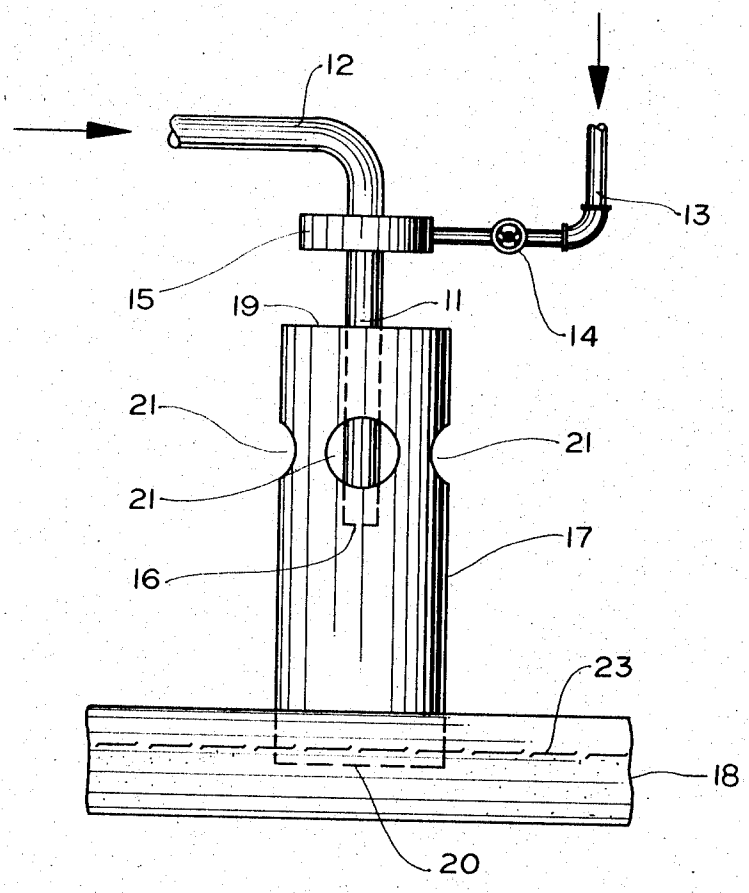
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GUNNING NOZZLE SHIELD

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GUNNING NOZZLE SHIELD

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ABSTRACT OF THE DISCLOSURE

Rebound and dusting while gunning a fluent granular material onto a target surface are reduced when the gun nozzle is surrounded by a cylindrical shield having holes in the portion opposite the nozzle, the open end of the shield being held against the target surface.

This invention concerns a method and means for placing fluent materials.

It has long been customary to place a fluent material, for example concrete, by mixing the solids, for example Portland cement, sand, and aggregate, with water and casting the resulting slurry into forms. In recent years, it has also become common to place fluent materials, for example granular refractory mixes containing a binder or cement, by projecting them through a nozzle or gun and onto a wall or other structure in which they are to be used, water being admixed with the dry granular solids just prior to projection from the gunning nozzle. This method has the advantage of rapidly and economically conveying the material to its ultimate location without the use of mechanical conveyors or hoppers or wheelbarrows and effecting the admixture of water without using batch mixers.

However, one of the problems occurring with the gunning method of placing fluent granular materials is that there is considerable rebound or dusting. In other words, some of the material does not stay in place where it has been projected but bounces off as a dust or spray and is generally lost. This causes variations in sizing and composition of the material and decreases its strength and density.

There has now been discovered, according to this invention, a method and means for reducing and practically eliminating the amount of rebound material when fluent solids are placed in a form or elsewhere by the gunning method of projection. The following specific description of one embodiment of the present invention is intended by way of illustration and not as limiting of the scope of the invention.

The drawing shows a side elevational view of an apparatus according to this invention. The apparatus comprises a conventional gunning nozzle **11** to which fluent granular material is conveyed through hose **12**, for example by compressed air. Water, supplied to the apparatus through line **13**, is admixed with the solid granular material at a water ring **15**, the flow of water being controlled by valve **14**. The wetted admixture is then projected out through opening **16** in nozzle **11**. The gunning nozzle, water ring, water valve, and associated feed lines are conventional and any such apparatus known in the art can be used in the practice of this invention.

Attached to the gun is a tubular member **17** which is of substantially constant or uniform cross-sectional area and shape from end to end. Conveniently, it will be of circular cross-section and can be made, for example, of sheet metal. Tubular member **17** has a lower open end **20** and an upper closed end **19** through which gun nozzle **11** enters. It also contains side openings **21**, located in its wall and placed adjacent upper end **19**. Tubular member **17** is placed so that gun nozzle **11**, and particularly

exit **16** therefrom, lies within tubular member **17**. More specifically exit **16** lies at a point within tube **17** more remote from end **19** than are holes **21**. Thus, when fluent material is discharged from exit **16** of nozzle **11**, it is discharged within tubular member **17**, which is firmly affixed to nozzle **11**. Preferably, nozzle **11** is placed concentrically within tubular member **17**, particularly when the tubular member is of circular cross-section.

In using the apparatus illustrated, open end **20** of tubular member **17** is placed against the surface onto which fluent material is to be projected. Fluent material is then projected from the gun to the nozzle and through tubular member **17**, striking the target surface. A form **18** is shown in the drawing. It is essential that end **20** be kept up against the target surface, which will, after some material has been placed, be fluent material already in position.

When tubular member **17** is in this position, the air which accompanies the fluent material, having been used to project it through hose **12**, and onto the target surface, is forced to leave tubular member **17** through openings **21**.

When this method of operation is used, it is found that rebound of the projected material is substantially eliminated and that the air escaping from the region of projection does not carry with it any of the fine granular material. Not only does this prevent waste of material projected, but also helps to maintain a clear and unfogged atmosphere in the vicinity of the gunning operation. This method of operation also prevents segregation of the coarse and fine components of the projected fluent solid material. The placed material can be left as placed or subsequently vibrated or rammed in place to achieve maximum strength and density.

While this apparatus and the method of using it have been found to be particularly useful in gunning fluent refractory materials, for example to form a monolithic hearth in an open hearth steel making furnace, it will be understood that they can be used whenever it is desired to project fluent granular materials, such as structural concrete, by the gunning method.

While it has been said that end **20** of tubular member **17** will be maintained in contact with the surface against which the fluent material is projected, it will be understood that it is possible for the end of tubular member **17** to project into or lie below the surface **23** of material already placed, as is shown in the drawing.

While the dimensions of the apparatus are not critical, it has been found to be particularly effective when the area of openings **21** are about sixteen times the area of nozzle exit **16**, and when the cross sectional area of tube **17** is about 40 times the area of nozzle opening **16**.

What is claimed is:

1. A device for placing wetted fluent granular solid material comprising:

(1) a conduit through which dry granular material can be fluently conveyed, said conduit having an entrance end and an exit end;

(2) means in the conduit adjacent the exit end thereof adapted to introduce water into dry granular solid material being fluently conveyed through said conduit; and

(3) a hollow tubular member having a closed upper and an open lower end; and side wall openings adjacent the upper end, said tubular member being disposed about the exit end of the conduit so that the conduit exit lies within the tubular member and is located at a point more remote from the upper end of said tubular member than any portion of said side wall openings.

2. A device as in claim **1** wherein said tubular member is of larger internal cross sectional area than said nozzle and is of uniform cross sectional area and shape, and

said side openings are symmetrically placed about the wall of said tubular member.

3. A device as in claim 2 wherein said tubular member is disposed concentrically about said nozzle.

4. A device as in claim 2 wherein the cross sectional area of said tube is about 40 times the area of the nozzle exit and the total area of said side openings is about 16 times the area of the nozzle exit.

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