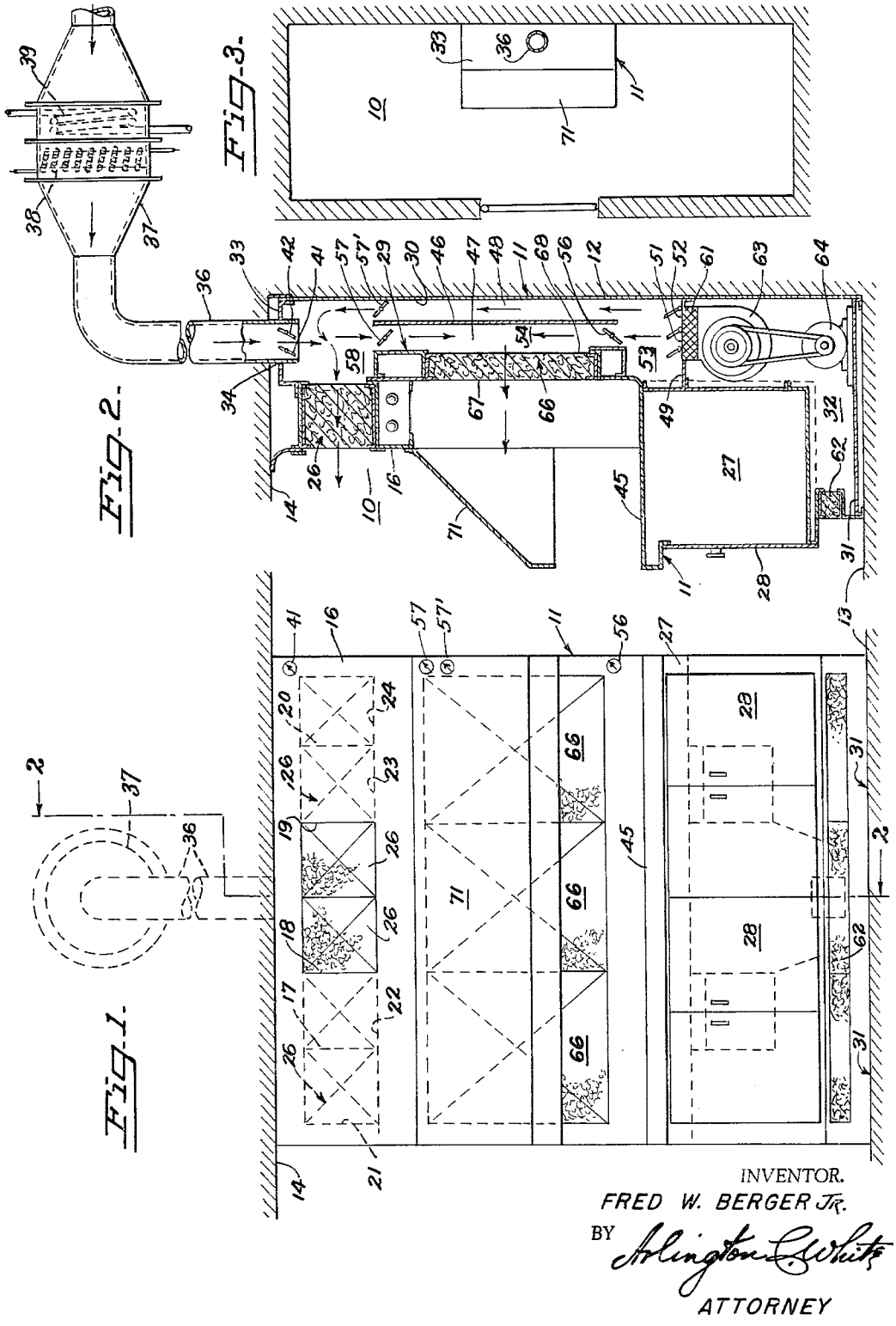
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PORTABLE WORK BENCH AND AIR CONTROLLER SYSTEM

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PORTABLE WORK BENCH AND AIR CONTROLLER SYSTEM

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The invention, in general, relates to systems for maintaining areas as free as possible from particulate matter. More particularly, the invention relates to an improved self-contained work console with an associated blower air system and high efficiency filters for removable installation in spaces or areas containing means for assemblying or manufacturing precision instruments, devices or equipment and components thereof.

It is perhaps well known, considerable difficulties have been encountered in providing precision mechanical and electronic components which have satisfactory operation over desired periods because of the presence thereon of small extraneous particulate matter. It also is perhaps well known that such particulate matter is air borne into areas of manufacturing facilities for such precision components by ventilating or air conditioning systems, and that considerable effort has gone into the development of improved air controlled systems as well as in employee instruction programs in an endeavor to reduce to a minimum the amount of extraneous particulate matter that is brought into an area either air borne as stated above, or on parts utilized for the manufacture of the precision components, or on personnel operating manufacturing equipment. While there has been some success in these developments, the improved systems heretofore devised and installed have in many cases resulted in extremely uncomfortable working conditions for workmen and in some instances injury to an operator's health. The present invention is directed to the provision of an improved portable work bench and associated air controlled system which obviates the inherent disadvantages of prior air conditioning and air filtering systems developed for removal of extraneous particulate matter from areas wherein relatively small precision devices and equipment is either assembled or manufactured or otherwise handled.

A primary object of the present invention is to provide a portable work bench and associated air control system which effectively reduces to a minimum dust and other extraneous particulate matter from the work bench itself as well as the space in which it is installed as well as affords optimum working conditions for operators at the work bench.

Another important object of the invention is to provide an improved portable work bench and associated air control system of the indicated nature which is additionally characterized by its facility of removable installation in spaces where air conditioning and ventilating systems exist and its capability of improving working conditions as well as elimination of particulate matter air borne into the space by such systems.

A still further object of my present invention is to provide a portable work console with self-contained air control components which is relatively inexpensive to manufacture and install.

Another object of the invention is to provide a combined work bench and air control system of the aforementioned character which eliminates the necessity for

installation of extensive insulated duct systems as well as the necessity for long refrigerant and hot water pipe lines.

Other objects of the invention, together with some of the advantageous features thereof, will appear from the following description of a preferred embodiment of the invention which is illustrated in the accompanying drawings. It is to be understood, however, that I am not to be limited to the precise embodiment shown, nor to the precise arrangement of the component parts illustrated, as my invention, as defined in the appended claims, can be embodied in a plurality and varity of forms and carried out in a plurality and variety of ways.

Referring to the drawings:

FIG. 1 is a front elevational view of a preferred embodiment of the invention, this view omitting the air supply line and coils.

FIG. 2 is a sectional side elevational view of the preferred embodiment of the invention, this view being taken on the line 2—2 of FIG. 1 and including the air supply system.

FIG. 3 is a top plan view, as installed in a room shown in cross-section.

In its preferred form, the portable work bench and air control system of my present invention preferably comprises a console including a work table supported at a predetermined level from a floor of a room, as well as including cabinets at opposite sides of said work table defining storage spaces, an upper section on said console fashioned with a plurality of horizontally disposed passages therein, a filter in each of said passages; said console extending between the floor and the ceiling of any given room and including a rear section and a lateral extension of said rear section defining a vertically disposed partitioned passage opening at the top thereof through said ceiling and opening to the room adjacent to the floor thereof through a laterally extending duct in said lateral extension, together with means for drawing successive streams of returned air from said room through a filter into said vertically disposed passage, means for supplying successive streams of pressurized incoming air into said vertically disposed passage at the top thereof for mixing with said returned air, and means for directing streams of mixed incoming and returned air through filters into said room through said horizontally disposed passages and across said work table through filters in an opening in said rear section of said console.

The present invention utilizes to some extent the so-called laminar flow principle which employs the incoming clean air of an air conditioning system as a purging mass to minimize the effect of high room particulate count on products worked upon in any given area; such purging mass being caused to sweep the top of the work bench. In all prior systems utilizing the laminar flow principle, substantially 100% recirculated room air is handled and no attempt is made in such installations to reduce the temperature of the purging mass of recirculated air. As a result, there can be and is great discomfort to workmen at the bench especially where high heat generating devices are used on the work bench. Where a second air system is used along with the laminar flow across the bench, such second air system is required to handle the entire cooling load, with the cooled air distributed in the room through a conventional diffuser system. While

the thus distributed air is adequately filtered, the problem of agitation of particulate matter and settlement thereof on the components being produced is again and again encountered with the result that much of the advantage of the laminar flow bench system is lost. In my improved work bench and air controlled system, in addition to the laminar flow across the work bench, laminar flow of conditioned air into the room **10** is also included in the air controlled system associated with the work bench.

My present combination eliminates the need for a return air ventilating system, reduces the supply air system to a relatively small duct, and entirely eliminates the need for any other or additional system of air distribution. Moreover, only a small duct system is required to exhaust an amount of air consistent with the fresh air ventilating requirements of any given space, and no costly insulated air supply duct system is required since all cooling is accomplished by relatively small cooling coils in close proximity to the work bench. As will hereinafter appear, if manufacturing conditions require an even more carefully controlled environment, the bench can be converted to a hood by the provision of a suitable canopy over the bench.

As particularly illustrated in FIG. 1 of the annexed drawings, my improved portable work bench is embodied in a console, generally designated by the reference numeral **11**, which may be readily moved into position within a room or space and preferably against a wall **12**, as shown in FIG. 2, as well as easily removed and relocated in another space where the dimensions between a floor **13** and a ceiling **14** in such spaces are substantially the same and an air conditioning or air supply system is already or can readily be installed. The portable work bench or console **11** preferably is fabricated for the most part of steel and is fashioned with an upper section **16** which is divided by means of suitable partitions **17**, **18**, **19** and **20** into compartments or horizontally disposed passages **21**, **22**, **23** and **24** for the reception of high efficiency filters, all designated generally by the reference numeral **26**, through which incoming air under pressure is supplied to the room or space in which the console **11** is located; it being understood that the number of passages and filters therein which are provided in the upper section **16** of the console is dependent upon the size of the room to be air conditioned and from which particulate matter is removed.

In accordance with the present invention, the work console **11** also preferably is so constructed as to provide a lower section **27** defining storage space accessible by the opening of doors **28**, as well as partitioned rear section **29** which extends for the full height of the console and which defines a vertically disposed passage generally designated by the reference numeral **30**. The rear section **29** is extended forwardly of the work console **11** underneath the storage cabinets **27** thereof and at each side thereof to provide extensions **31** which are hollow and which define horizontally disposed passages **32** merging at substanitally right angles with the vertically disposed partitioned passage **30** of the rear section **29** of the console. As shown particularly in FIG. 2 of the annexed drawings, the upper and rear sections **16** and **29**, respectively, of console **11** is provided with a top closure **33** which is formed with an opening **34** therein at rear section **29** for the reception of a duct **36** leading from a source of fresh air under compression, not shown, which is caused to pass through an enlarged duct-section **37** housing both heating coils **38** and refrigeration means **39** which are controlled in the conventional manner to either heat or cool incoming fresh conditioned air which is admitted into the vertically disposed passage **30** from duct **36**, as regulated by suitable dampers indicated by the reference numerals **41** and **42** adjacent to the outlet end of duct **36**.

In order properly to control the flow of incoming air as well as to mix the same with returned air from the room and to deliver a mixture of the two not only into the space or room occupied by the console **11** but also across a work table **45** provided between the side cabinets thereof and at a level suitable for an average size workman, such delivered mixtures constituting two laminar flow streams of conditioned air at a temperature desired and suitable for all working conditions, I preferably fasten a partition **46** across the rear section **29** of the console to divide the vertically disposed passage **30** into relative narrow ducts **47** and **48** of substantially similar width. I also provide a short horizontally disposed partition **49** across the passage **30** adjacent to the bottom thereof and provide a series of openings **51** and **52** therein to establish communication between the upper and lower partitions of passage **30**; such partition **49** defining a plenum **53** at the lower rear of rear section **29** of the console **11**. The arrangement of partitions **46** and **49** together with the front and rear walls of the rear section **29** of the console not only affords the provision of the distribution plenum **53** but also a bench filter plenum **54** for distributing pressurized air from plenum **53** through regulatory damper **56** to passage or duct **47**.

By this arrangement, room return air from duct **47** passes through a damper regulator **57** to be mixed in a plenum **58** with high temperature difference air from the air conditioning supply system entering through duct **36**. Part of this mixture of return air and conditioned air is caused to pass out to the room or space occupied by the console **11** through high efficiency filters **26**, which are only schematically shown in FIG. 1 of the drawings. This becomes the conditioned air supply system under laminar flow to the entire area occupied by the console and workmen, and although the high efficiency filters **26** which may be selected for this phase of the system may be designed to have a face velocity of approximately two hundred feet per minute, which is higher than velocities normally associated with laminar flow, such velocity is far below the distribution velocity normally used in conventional air conditioning systems and thus agitation is reduced to and maintained at a minimum. This clean or room side of the high efficiency filters **26** acts as an air distribution fixture, and the extremely clean air leaving the filters **26** tends to sweep particulate matter from the upper region of the space occupied by the console **11** and force this particulate matter swept from the upper region of such space downward toward the floor **13** where it is returned and filtered through a grille **61** and medium efficiency air filter assembly **62** located at the front of the console **11** at floor level to the distribution plenum **53**. While any desired suction means can be employed for drawing return air through filter **62**, I preferably utilize an air blower **63** which is actuated by a motor **64** through conventional belt and pulley drive; the electrical connections between the motor and a source of electrical energy being conventional and not shown in the drawings because of lack of space. Since the foregoing phase of the system can be operated at a reasonably high temperature difference, the bulk of the room's cooling and heating load can readily be handled and controlled easily by personnel from within the room.

Part of the mixture of return air, entering plenum **58** after passage through duct **48** and regulator damper **57'**, and the conditioned air entering plenum **58** from the supply duct **36** becomes along with room return air delivered from plenum **53** to plenum **54** through regulating damper **56**, the laminar flow bench system. Such mixtures of room return air and conditioned fresh air supplied from duct **36** to plenum **58** and in turn to plenum **54** through regulating damper **57'** is caused to pass through high efficiency filters, designated generally by the reference numeral **66** and only schematically shown in FIG. 1, which are disposed in spaces defined by the back **67** of the work table **45** and in the front panel **68** of the rear section **29** of the console; such front panel **68** of rear section having a relatively wide opening therein to permit passage of the mixed air, as above described, into and through the filters **66**. The high efficiency filters **66** for the laminar flow bench phase preferably are designed for

a discharge face velocity of approximately fifty feet per minute, and since this velocity is barely within the perceptible draft range and since for all practical purposes laminar air flow exists at this point, ideal work conditions at the work table **45** are established. Where deemed desirable, a canopy **71** can be installed above the work table **45** by fastening the same to the front face of the upper section **16** of the console and projecting the same outwardly and downwardly at an incline, as shown.

It is clear from the foregoing description and reference to the annexed drawings that I have provided a portable work bench and associated air conditioning system which, by a relatively simple manipulation of the several damper regulators above described, affords to the technician a bench or work table temperature to suit his particular needs. If, for example, his work temperature becomes relatively high by reason of the heat generated by the work undertaken, and he desires to adjust that temperature, it is desirable that he continue to work but with fairly low entering air temperature. Or, in other cases, an air supply at room temperature may be desirable.

While not shown, properly designed compact condensing and evaporating units may be located and installed in close proximity to the work table **45**. And, as indicated in FIG. 2, heating and cooling coils for the air supply can be located in the attic or roof space directly above the room occupied by console **11**. It is of course obvious that installation conditions for my improved portable work bench will vary from facility to facility but in practically every instance it is apparent that it is a relatively simple matter to make such installation with associated air conditioning systems.

In the improvement hereinabove described, not only does ultra clean air sweep the upper region of the space occupied by console **11** in one laminar flow as indicated by the arrow A but also sweeps the bench top or work table **45** in another laminar flow as indicated by the arrow B to carry particulate matter outward and downward to the floor level to be recirculated and purged in the filters provided in both phases of the laminar flow systems.

It is to be understood that the appended claims are to be accorded a range of equivalents commensurate in scope with the advances made over the prior art.

I claim:

1. A portable work bench and air controller system for maintaining optimum temperature work bench conditions as well as a dust-free space in which the work bench may be removably installed; said bench and system comprising a work table supported in said space, means for delivering filtered air into said space above and beyond said work table, means for causing filtered air to sweep across said work table into said space, means for spacially separating the two said air delivery means, means for withdrawing air delivered into said space and containing entrained particulate matter and for purging such air of said particulate matter, and means for controlling the temperature of the filtered air caused to sweep across said work table.

2. A portable work bench and air controller system for maintaining optimum temperature work bench conditions as well as a dust-free space in which the work bench may be removably installed; said bench and system comprising a work table supported in said space, and laminar flow air distribution means comprising means for delivering filtered air into said space above and beyond said work table, means for causing filtered air to sweep across said work table into said space, means for withdrawing air delivered into said space and containing entrained particulate matter as well as simultaneously filtering the same to provide a purged returned air substantially free of dust and particulate matter, means for recirculating purged returned air partially into said space above and beyond said work table and partially across said work table, and adjustable means for varying the temperature of the air delivered into said space and caused to sweep across said work table.

3. A portable work bench and air controller system for maintaining optimum work bench temperature conditions as well as a dust-free space in which the work bench may be removably installed; said bench and system comprising a console removably supported in a space bounded by four walls, a floor upon which said console is seated, and a ceiling, means forming an opening in said ceiling communicating with a source of air under pressure, a work table supported in said console, a top on said console means forming an aperture through said top and aligning the aperture with said opening in said ceiling, and laminar flow air distribution means comprising means for delivering pressurized air from said source to said console through said opening in said ceiling and said aperture in said top, filter means in said console adjacent to said top, means for causing delivered air to pass through said filter means into said space above and beyond said work table, additional filter means in said console adjacent to said work table, means for causing a portion of said delivered air to pass through said additional filter means and to sweep across said work table into said space, means for withdrawing air delivered into said space and containing entrained dust and particulate matter as well as simultaneously filtering the same to provide a purged returned air substantially free of dust and entrained particulate matter, means for recirculating purged returned air for mixing with said delivered air from said source of air under pressure and for causing the mixture partially to be delivered into said space above and beyond said work table and partially to be caused to sweep across said work table into said space, and means for controlling the temperature of the air caused to be delivered into said space and caused to sweep across said work table.

4. A portable work bench for removable installation in a space bounded by four walls, a floor and a ceiling, means forming an opening therein communicating with a source of pressured air which may be caused to be delivered under laminar flow distribution through said bench into said space; said bench comprising a console removably seated on said floor, a partitioned top section on said console providing a plurality of horizontally disposed compartments, a top on said top section, means forming an aperture through said top and aligning the aperture with said opening in said ceiling, a partitioned rear section on said console providing a plurality of vertically disposed ducts communicating at the top thereof with said source of pressurized air through said aperture of said top and said opening in said ceiling, a lower section on said console; said lower section having a horizontally disposed passage communicating at the rear thereof with said vertically disposed ducts of said rear section and at the front thereof with said space, a work table supported on said lower section, a rear wall on said work table having a relatively large opening therein communicating with an adjacent vertically disposed duct of said rear section, a first air filter means in each of said compartments of said top section, a second air filter means in said passage of said lower section adjacent the front thereof, a third air filter means in said relatively large opening of said rear wall of said work table, and a suction means in said passage of said lower section for withdrawing filtered air delivered into said space and containing entrained dust and particulate matter and causing the same simultaneously to pass through said second filter means to provide purged returned air substantially free from dust and particulate matter for movement through said passage into said vertically disposed ducts and redelivery by laminar flow distribution into said space through said first air filter means and across said work table through said third air filter means.

5. A portable work bench as defined in claim **4**, and adjustable means on said console for regulating the tem-

perature of pressurized air caused to pass through said first air filter means in said compartments and caused to sweep across said work table through said third air filter means into said space.

6. A portable work bench as defined in claim **4**, and a mixing plenum adjacent the top of said vertically disposed ducts in said rear section for mixing returned air from said space with pressurized air delivered from a source thereof to said console through the aperture in the top thereof.

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