Feb. 11, 1947. M. I. DORFAN 2,415,471

FUME REMOVING AND TREATING APPARATUS

Filed Sept. 23, 1943 3 Sheets-Sheet 1

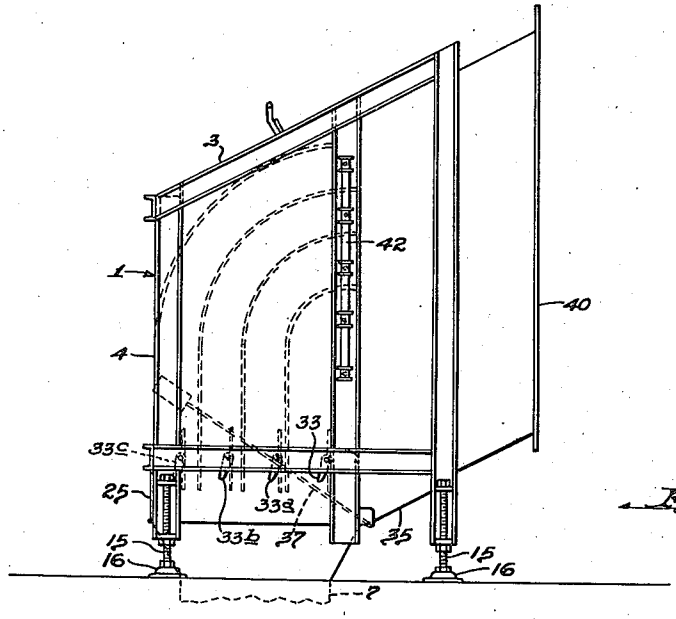


Fig. 1.

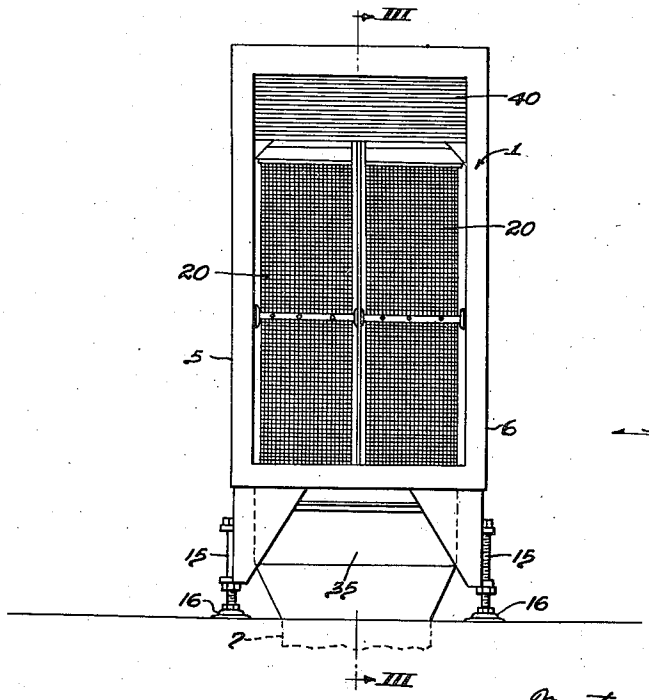


Fig. 2.

INVENTOR.
Morton I. Dorfan
BY Brown, Critchlow & Flick
ATTORNEYS.

WITNESSES.
E. J. Maloney.

Feb. 11, 1947. M. I. DORFAN 2,415,471

FUME REMOVING AND TREATING APPARATUS

Filed Sept. 23, 1943 3 Sheets-Sheet 2

Fig. 5.

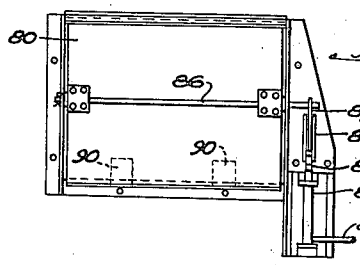


Fig. 3.

INVENTOR.
Morton I. Dorfan
BY Brown, Critchlow & Flick
ATTORNEYS.

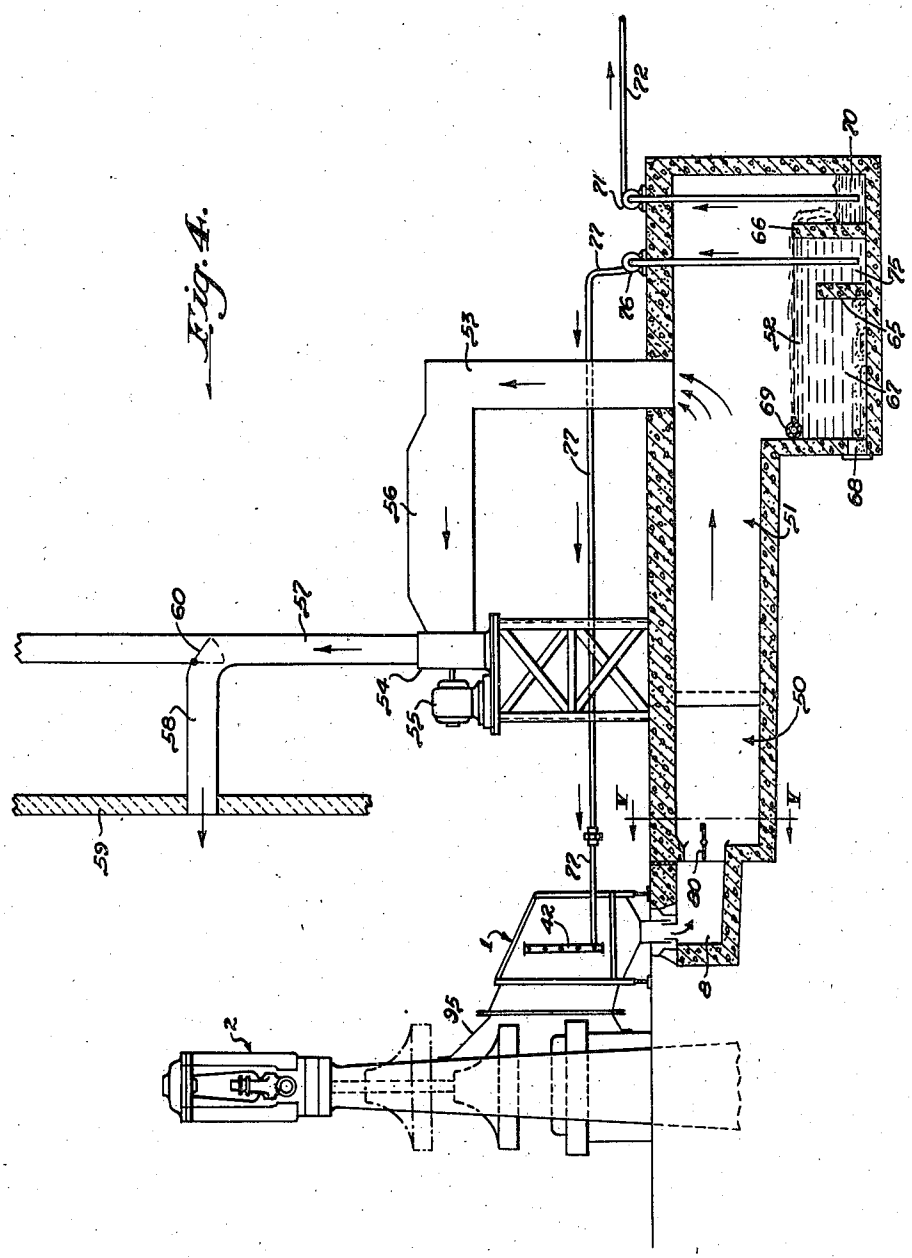
WITNESSES.
E. J. Maloney.

Feb. 11, 1947. M. I. DORFAN 2,415,471

FUME REMOVING AND TREATING APPARATUS

Filed Sept. 23, 1943 3 Sheets-Sheet 3

Fig. 4.



INVENTOR.
Morton I. Dorfan
BY Brown, Critchlow & Flick
ATTORNEYS.

WITNESSES.
E. J. Maloney.

Patented Feb. 11, 1947

2,415,471

UNITED STATES PATENT OFFICE

2,415,471

FUME REMOVING AND TREATING APPARATUS

Morton I. Dorfan, Pittsburgh, Pa.

Application September 23, 1943, Serial No. 503,570

5 Claims. (Cl. 98—115)

1

The invention relates to apparatus for removing fumes that are generated by industrial units such as hammers and presses for the hot forging of aluminum and aluminum base alloys, magnesium and magnesium base alloys, presses for thermoplastic molding operations, and the like. For example, in the hot forging of aluminum base alloys the forging hammers and blocks and the press dies are intermittently supplied with quantities of oily materials which, when heated by the hot metals being forged or pressed, form noxious and oily fumes that make the atmosphere highly objectionable in which to work, particularly when the fumes are produced in the large amounts that characterize the operation of several hammers and presses in a single factory room. It is with apparatus for removing such locally generated fumes that this invention is concerned.

The object of the invention is to provide apparatus for effectively removing fumes, such as those explained, that are locally generated by industrial units, the apparatus being so constructed that it is capable of being properly positioned close to the fume-generating parts of a unit and of being arranged to remove fumes at various locations or levels depending upon the particular work being done by the unit, and the apparatus being formed and equipped to treat the fumes and to dispose of them and of any hard particles removed with them, and to permit the return to a factory room of air withdrawn with the fumes.

The invention will be explained with reference to its applicability to apparatus for removing fumes that are generated by hammers or presses for the hot forging of aluminum and magnesium base alloys, although, as has been explained, it is not limited to such use.

In the accompanying drawings, which illustrate the preferred form of apparatus, Fig. 1 is a side view of a fume-receiving hood positioned upon a floor or floor-like support adjacent to a hammer forge; Fig. 2 a front elevation of the hood shown in Fig. 1; Fig. 3 a vertical central sectional view taken on the line III—III of Fig. 2 through the hood and the floor structure below it; Fig. 4 a diagrammatic view, partly in elevation and partly in vertical section, of a complete fume removing and treating system; and Fig. 5 a vertical sectional view taken on the line V—V of Fig. 4 illustrating a detail of construction.

The apparatus provided according to this invention includes a hood 1 adapted, as diagrammatically shown in Fig. 4, to be positioned at the side of an industrial unit such as the forging hammer 2. As shown in detail in Figs. 1, 2 and

2

3 the hood comprises an outer casing having a top 3, a rear wall 4, and sides 5 and 6, all of which are built in and supported by a substantially rectangular outer frame formed of structural elements such as channels. The front of the hood adjacent to hammer 2 is open to receive fumes, and its bottom is provided with a depending annular skirt 7 which forms a fume discharging opening that registers with a horizontally disposed orifice in a fume conduit 8 below the floor or floor-like support 9 upon which the hood rests. In a manner explained hereinafter, suction is applied through conduit 8 to cause fumes to be withdrawn from an industrial unit through the hood, the fumes entering its vertical receiving opening and being removed through its horizontal bottom discharging opening. Properly to seal the fume discharging opening of the hood with the orifice of conduit 8, such orifice is provided with an annular trough 10 for receiving the lower end of skirt 7, the trough being supplied with water or other suitable liquid to form a seal. When a hood is removed from its position above an orifice, a suitable cover may be placed upon a ledge 11 of trough 10 to close the orifice.

Depending upon the particular forging hammer or other industrial unit beside which a hood is placed, it is desirable to adjust the vertical position of the hood, and it is desirable also that the adjustments of its corners be independently effected to meet various conditions of service. For these purposes the corners of the hood are provided with supporting posts in the form of threaded rods 15, each of which is equipped with a threaded flanged base 16. Floor 9 is provided with openings 17 which receive the lower ends of post 15, and flanges 16 rest upon the floor surrounding the openings and each is screwed upon its threaded post 15 suitably to position a corner of the hood.

Within its fume-receiving opening the hood is preferably provided with a vertically disposed screen 20 for intercepting hard particles that may be entrained in the fumes or may be projected towards the fume-receiving opening. For example, such hard particles may be spritzers which fly laterally from hot metal when struck by forging hammers. The screen 20 is preferably formed of two parts, the lower edge of each of which rests within a channel or trough 21 formed at the bottom of the opening, the upper end being confined in an inverted channel or trough 22 formed at the top of the opening. Upper channel 22 has sufficient depth to permit each screen to

be raised to the height necessary to permit its lower end to be placed in channel 21, and to retain the upper end of the screen when it is lowered into channel 21. The bottom portion of the hood is also preferably provided with horizontally disposed screens 23 which may be of smaller mesh than vertical screen 20 to remove hard particles that may pass through the vertical screen. Each of screens 23 is independently supported by ledges 24 projecting inwardly from the sides 5 and 6 of the hood, and for removing these screens to clean them, and again replacing them, the rear wall 4 of the hood is provided with a door 25 which is pivoted to the hood by a horizontal pintle 26 so the door may be swung downwardly and upwardly when desired.

Between vertical screen 20 and horizontal screen 23 the interior of the hood is preferably divided into a plurality of fume passages 30, 30*a*, 30*b* and 30*c* by partitions 31, 31*a* and 31*b* which are curved at their tops as shown in Fig. 3. The lower ends of these passages are provided with dampers 32, 32*a*, 32*b* and 32*c* for selectively controlling flow through the passages, each damper being attached medially to a horizontal rod that is rotatably mounted in the sides of the hood, the several rods being provided at their outer ends with rocking arms 33, 33*a*, 33*b* and 33*c*. Each damper may be independently turned from its full to its dotted line position shown in Fig. 3 to close the passage that it controls, or to open it if closed. Thus if locally generated fumes are formed at about the level of the receiving openings of hood passages 30*a* and 30*b*, dampers 32 and 32*c* may be closed to shut off passages 30 and 30*c*. If the place of local generation of the fumes is above or below that of the position just stated, the appropriate dampers may be closed or opened to cause the suction to exert its effect through the passages whose receiving openings are opposite the location of fume generation.

In each of the hood passages 30, 30*a*, 30*b* and 30*c* water is preferably supplied to condense or precipitate, scrub or wash fumes. For this purpose the front end of each passage is preferably provided with one or more pipes 41, each provided with a series of openings for projecting small streams or atomized sprays of water in the general direction indicated by the lines leading from the left of the pipes. The outer ends of the pipes are connected to a header 42 to which spraying water is supplied.

The bottom of the hood in front of the plane of vertical screen 20 is preferably provided with a trap door 35 which is pivoted on a horizontal axis 36 to swing from its upwardly inclined position shown in full lines in Fig. 3 to its downwardly inclined position shown in dotted lines. Spritzers or other hard particles that fall and accumulate on door 35 may be dumped on the floor below the hood by swinging the door downwardly to its dotted line position. For holding door 35 in its alternate positions, the rotatable rod or spindle to which it is attached is provided with a weighted arm 37 which moves to and from its positions shown in Fig. 3, in either of which it remains until again moved. Below horizontal screens 23 the front of the hood is provided with a narrow elongate opening 38 whose lower wall forms a continuation of door 35 when this door is in its upper or closed position. Fume condensate which may be formed on screen 20 may drip from the bottom of the screen and flow through opening 38 into and through the fume discharge opening of the hood.

In the operation of a forging machine it may be equipped with blocks and hammers of different horizontal dimensions depending upon the particular material being forged. So that the effective fume-receiving opening of the hood may be as close as possible to the place of fume generation, the front of the hood is provided with a jacket 40 which is telescopically positioned within the front of the hood casing so that it may be moved outwardly as desired, it being shown in Fig. 1 in its fully extended position.

In Fig. 4 there is diagrammatically illustrated suitable instrumentalities for treating the fumes and water drawn and discharged into conduit 8 below each hood, one of which is positioned in front of each of several forging hammers which are usually placed in a line on a factory floor. Each conduit 8 communicates with a header passage 50 which in turn communicates with a chamber 51, on the floor of which the water from the hoods and the condensate entrained by it flows into a sump 52. The air withdrawn through the hoods with the fumes is withdrawn from chamber 51 through a conduit 53 by a fan 54 which may be driven by a motor 55, and which supplies the suction for withdrawing fumes into the hoods. Between the fan and conduit 53 there is shown an air washer 56 of any well known or desired construction, and beyond the fan the air is discharged into a stack 57 to the side of which a by-pass air pipe 58 is connected. This air pipe terminates in a wall 59 of a factory building, and the flow of air through it is controlled by a damper 60 in stack 57. The opening of damper 60 to cause the air to be discharged through pipe 58 into a factory room, or the closing of the damper to cause some or all of the air to be discharged through the stack to the outside atmosphere, depends upon conditions of service. For example, in cold weather when factory doors and windows can not be open without discomfort to the workmen the air withdrawn with the fumes may be returned directly to the factory room. On the other hand, in hot weather when factory doors and windows may be open the air may advantageously be discharged through the stack to the outside atmosphere.

Sump 52, which receives the water and entrained fume condensate, is illustrated as being provided with two walls 65 and 66 extending upwardly from its bottom, the top of wall 65 being lower than that of 66. Within the sump, wall 65 forms a compartment 67, to the bottom of which hard particles carried by the water settle, and may from time to time be withdrawn through an opening 68. The water in the sump is permitted to rise slightly above the level of the top of wall 66, and its surface is skimmed by streams of water from a pipe 69 positioned at a side as shown. These streams remove from the surface of the water to the left of partition wall 66 the floating condensate or sludge and discharge it into a sump compartment 70 at the right of wall 66. From sump compartment 70 the accumulated sludge may be removed by a pump 71 which discharges it into a line 72 for disposal as may be desired. From a sump compartment 75 formed between partition walls 65 and 66 substantially uncontaminated water may be withdrawn by a pump 76 and discharged into a line 77 connected to the headers 42 of the several hoods 1.

The fume removing apparatus herein disclosed has been placed in use in a large forging plant, and in such use has demonstrated its effective-

ness for removing fumes from many forges and presses variously constructed and equipped for different forging operations. While a forging hammer or press is idle, either between forging or pressing operations or because temporarily not in use, the fume conduit 8 leading from it is closed so that the suction of fan 54 is not then wasted. For this purpose each conduit 8 is provided with a damper 80 (Figs. 3 and 5) adapted to be moved from its open position shown in full lines in Fig. 3 to its closed position shown in dotted lines by means of pressure cylinder 81 and associated parts shown in Fig. 5. The bottom of this cylinder is connected by a pipe 82 to the pressure fluid line leading to the forge with which the conduit 8 is associated. Thus when pressure fluid is supplied to the forge to operate it, the pressure of the fluid acts upon a piston in cylinder 81 to elevate it and turn damper 80 from its closed to its open position, the turning being effected by an arm 85 extending laterally from a rod 86 to which the central portion of the damper is connected. As shown, arm 85 is connected by a link 87 to a piston rod 83 extending through the head of cylinder 81. Damper 80 may be provided with counterweights 90 to swing it to its closed position when the supply of pressure fluid to the forge is cut off.

In the use of the fume removing apparatus herein disclosed, assuming such use to be in a forging plant, a hood 1 is positioned in front of each forging machine that is in operation, and a suitable cover is placed over the orifice of each conduit 8 leading from a forging machine that is not in operation. Each hood is adjusted vertically by turning the flange base 16 on each post 15 properly to position the hood with relation to the forge, and jacket 40 is extended outwardly from the vertical fume-receiving opening of the hood so that it is as close as practically possible to the metal working tools of the forge, or registers with a shield 95 explained below. As a part of the adjustment of each hood, the dampers 32, 32*a*, 32*b* and 32*c* at the lower ends of passages 30, 30*a*, 30*b* and 30*c* are positioned to leave open such of these passages whose receiving ends are closest to the place of fume generation and to close the other passages. Preferably, the frame of each forging machine is provided with a fume-confining shield 95 which extends laterally from the frame to meet the outer edge of jacket 40, as diagrammatically shown in Fig. 4.

Fan 54 (Fig. 4) being placed in operation, air is partially exhausted from chamber 51 and header 50, the latter of which communicates with each of the several conduits 8 whose orifice is below a hood. When the pressure is supplied to each forge cylinder, the damper 80 in the conduit 8 adjacent to the forge is opened by the pressure cylinder mechanism illustrated particularly in Fig. 5. This permits the suction created by the fan to exert its influence to withdraw through the hood the fumes generated by the forge. The fumes, or a portion of them, are condensed or absorbed by the water supplied to the hood through conduits 41, and this water is treated as shown in Fig. 4 and explained with reference thereto. The air withdrawn through the hood with the fumes is also treated as shown in and explained with reference to Fig. 4, and all or any desired portion of it may be returned to the forging room through air pipe 58 or discharged to the atmosphere through stack 57.

According to the provisions of the patent statutes, I have explained the principle and operation of my invention, and have illustrated and described what I now consider to be its best embodiment for a particular use. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than specifically illustrated and described.

I claim:

1. Apparatus for removing fumes that are locally generated by industrial units, comprising a floor-like support adjacent to such a unit and provided with a fume conduit having a horizontally disposed orifice, a removable hood positioned above said orifice having a bottom wall provided with a fume discharging opening registering therewith and having a fume-receiving opening at one of its sides, a removable vertically disposed reticulated wire screen in said fume-receiving opening formed to intercept hard particles entrained in fumes entering the hood, a removable horizontally disposed screen borne by the hood adjacent to said fume-discharging opening and horizontally removable through a side of the hood, and means for applying suction through said conduit and hood to withdraw fumes from such unit through said receiving opening.

2. Apparatus for removing fumes that are locally generated by industrial units, comprising a floor-like support adjacent to such a unit and provided with a fume conduit having a horizontally disposed inlet orifice, a removable hood positioned above said orifice having a bottom wall provided with a fume discharging opening registering with said inlet orifice and having a fume-receiving opening at one of its sides, a vertically disposed screen positioned in said fume-receiving opening formed to intercept hard particles entrained in fumes entering the hood, a trap door attached to said bottom of the hood below said screen and extending outwardly therefrom, and means for maintaining said door in an upper closed position to receive particles from an industrial unit and to open said door downwardly to discharge such particles from the hood.

3. The combination of an industrial unit that is intermittently operated by fluid pressure and which generates fumes when in operation, of apparatus for removing such fumes comprising a suction conduit having an inlet adjacent to the unit, a hood positioned between said unit and inlet and having a fume discharging conduit communicating with said inlet and a fume-receiving opening adjacent to said unit, a normally closed damper for controlling flow through said conduit, and means for opening said damper actuable by pressure fluid supplied to said unit to operate it.

4. Apparatus for removing fumes that are locally generated by industrial units, comprising a floor-like support adjacent to such a unit and provided with a fume conduit having a horizontally disposed orifice, a removable hood positioned above said orifice having its bottom provided with a fume discharging opening registering therewith and having a fume-receiving opening at one of its sides, a removable vertically disposed screen in said fume-receiving opening to intercept hard particles entrained in fumes entering the hood, a horizontally disposed screen borne by the hood adjacent to said fume-discharging opening, said horizontally disposed screen being of finer mesh than said vertical screen and being horizontally removable from the hood through a side thereof, and means for applying suction through said conduit and hood

to withdraw fumes from such unit through said receiving opening.

5. Apparatus for removing fumes that are locally generated by industrial units, comprising a floor-like support adjacent to such a unit and provided with a fume conduit having a horizontally disposed orifice, a liquid-containing trough surrounding said orifice, a removable hood positioned above said orifice having its bottom provided with a depending annular skirt extending into said trough to form a liquid seal therewith at vertically adjustable positions of the hood, such skirt forming a fume-discharging opening and said hood having a fume-receiving opening at one of its sides, said hood being provided with a plurality of supporting posts resting upon said support and being vertically adjustable independently of each other, and means for applying suction through said conduit and hood to withdraw fumes from an industrial unit through said receiving opening.

MORTON I. DORFAN.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,252,954	Wheller	Aug. 19, 1942
848,803	Brady	Apr. 2, 1907
2,277,271	Schneible	Mar. 24, 1942
1,926,120	Snediker	Sept. 12, 1933
2,045,519	Coutant	June 23, 1936
1,978,938	Grob	Oct. 30, 1934
1,767,869	Baumgarten	June 24, 1930
1,905,243	Rogers	Apr. 25, 1933
1,552,316	Krieg	Sept. 1, 1925
1,392,870	Fessler	Oct. 4, 1921
2,257,516	Roche, Jr., et al.	Sept. 30, 1941
2,301,351	Willmott	Nov. 10, 1942
2,289,910	Hanson	July 14, 1942
818,003	Thorelius	Apr. 17, 1906

FOREIGN PATENTS

Number	Country	Date
673,506	French	Oct. 8, 1929
37,423	Netherlands	Jan. 17, 1936
564,675	French	Oct. 27, 1923